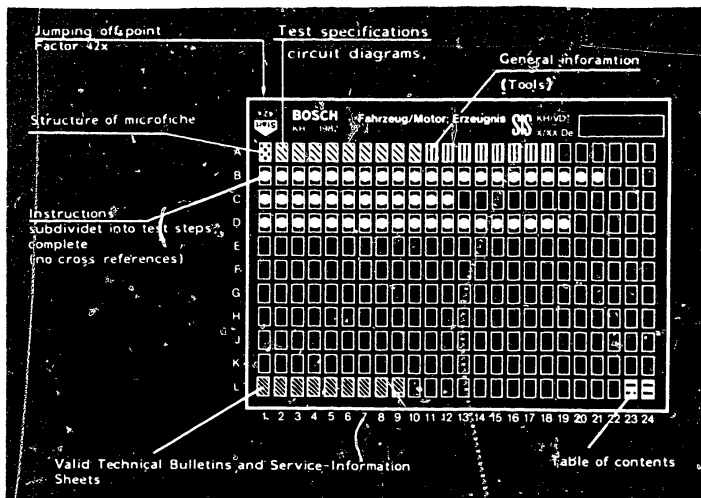


Structure of microfiche

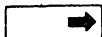


1. Read from left to right
2. Title of microfiche (appears on each coordinate)

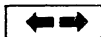
E 16	Product/assembly/test step	
	Vehicle/engine	

↑
Coordinate

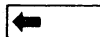
3. Limits of section



Beginning



Mid-section



End



One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6

C 6

A 1

Repair and testing



1. Test specifications - electrical

Suppression capacitor 1.8...2.6 μ F

B3

Unidirectional-breakdown diode 20....24V
(only for 14 V alternators)

B5

Regulated voltage

Part number	Regulated voltage V	Load current A
0 192 052 015	13.7...14.5	} \leq 10
0 192 052 016	13.7...14.5	
0 192 052 020	13.7...14.5	
0 192 052 021	13.7...14.5	
0 192 052 027	13.7...14.5	
0 192 052 028	13.7...14.5	
0 192 052 029	13.7...14.5	
1 197 311 003	13.7...14.5	
1 197 311 004	13.7...14.5	
1 197 311 005	13.7...14.5	
1 197 311 006	13.7...14.5	} \leq 10
1 197 311 007	14.1...14.9	
1 197 311 008	14.1...14.9	
1 197 311 009	13.7...14.5	
1 197 311 010	13.7...14.5	
1 197 311 011	13.7...14.5	} \leq 10
0 192 053 001	27.6...28.4	

A2

Test specifications - electrical
Alternators 0 120 300..., 0 120 339...,

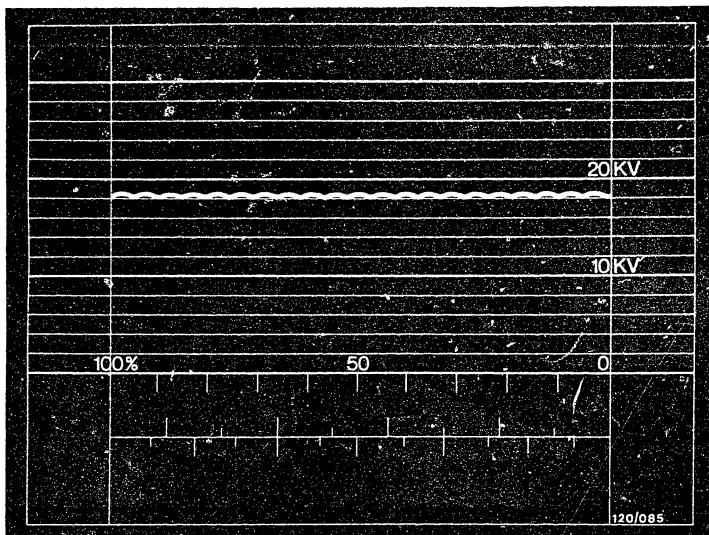


Power test (warmed-up alternator (60°C) with regulator)

Alternators 0 120 3..	Power test		Resistance values	
	Speed min ⁻¹	Load current A	Stator ²⁾ Ω + 10%	Rotor Ω + 10%
G1(RL)14V13A15	1100	5	0.83	9.0
	1500	8		
	7000	13		
G1(RL)14V15A20	1450	5	0.4	6.5
	2000	10		
	6000	15		
G1(RL)14V18A20	1350	5	0.4	5.5
	2000	12		
	6000	18		
G1(RL)14V24A23	1350	5	0.4	4.0
	2300	16		
	7000	24		
G1(RL)14V28A22	1500	10	0.26	4.0
	2200	18		
	7000	28		
G1(RL)14V30A23	1200	2	0.26	4.0
	2300	20		
	7000	30		
G1(RL)14V33A27	1600	10	0.28	4.0
	2700	22		
	7000	33		
G1(RL)28V19A25	1400	3.5	0.83	9.0
	2500	13		
	7000	19		

2) Between the phase outputs





Oscilloscope display OK

If the alternator is OK, the above oscilloscope pattern will be displayed. The DC output has a slight ripple. The pattern can exhibit small peaks when the voltage regulator comes into operation. The regulator can be stopped by means of switching in loads (e.g. load resistor).

Adjust the pattern height so that the ripple is contained between two adjacent kV lines.

In order to be able to compare such patterns, the pattern concerned is to be adjusted with the vertical control of the oscilloscope so that it fits approximately between the 10 kV and 20 kV lines.

Note: more than one defect can be present at one time.



2. Test specifications - mechanical

True-running error

O.D. of rotor 0.05 mm

O.D. of collector rings 0.03 mm

B19

One-sided air gap \geq 0.22 mm

Minimum diameter of collector rings

Alternators 0 120 3.. new 27.8 mm

min. dia. 26.8 mm

B4

Minimum projection of carbon brushes

Alternators 0 120 3... new 10.0 mm

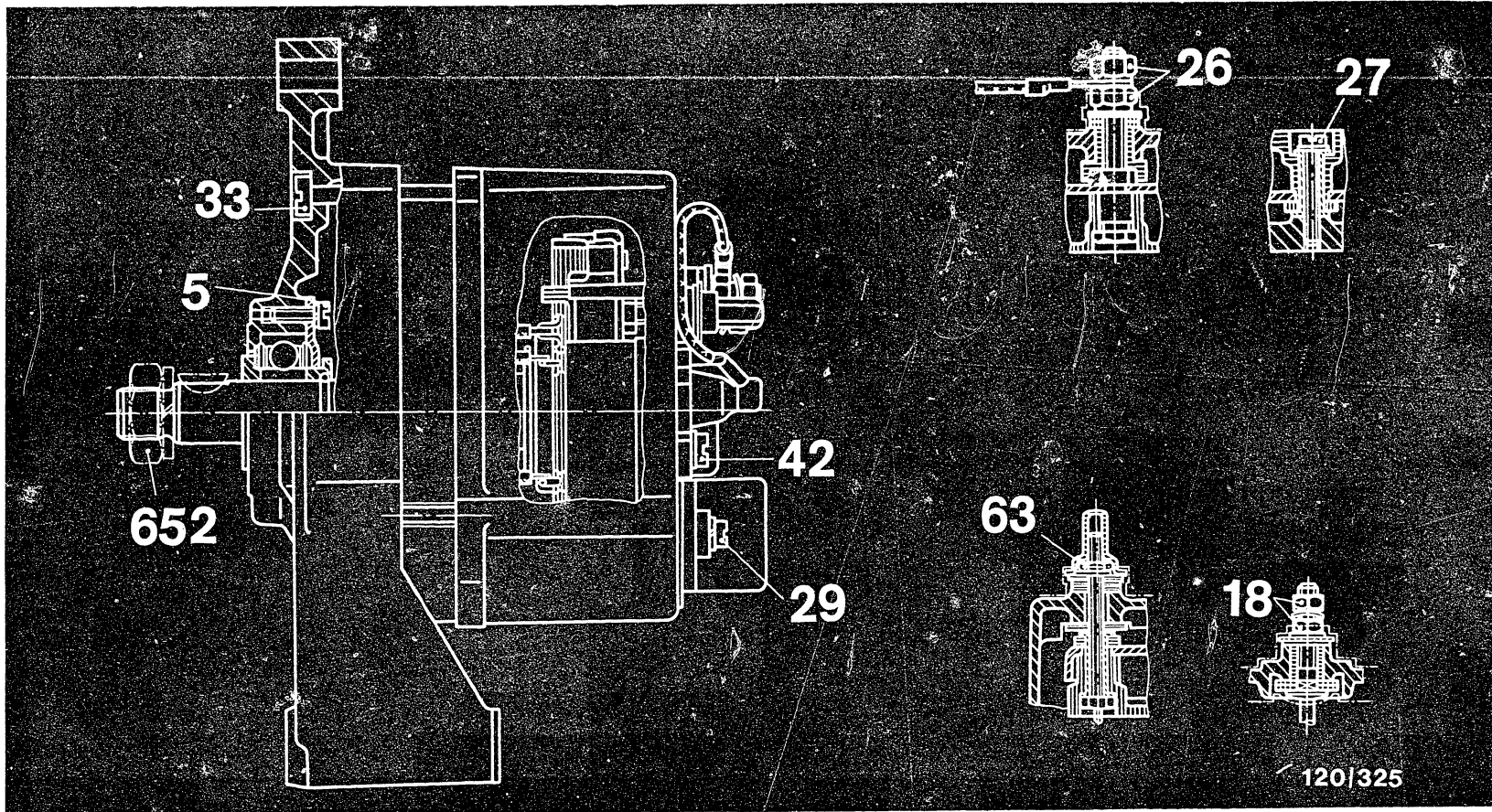
min. 5.0 mm

A5

Test specifications - mechanical

Alternators 0 120 300... 0 120 339...





2.1 Tightening torques

Items 5	2.1 ... 3.0 Nm
Item 18, 26 Bottom nut	2.9 ... 4.1 Nm
Item 27	1.4 ... 2.0 Nm
Item 18, 26 Top nut	2.7 ... 3.8 Nm
Items 33	4.1 ... 5.5 Nm

Item 42	2.9 ... 4.1 Nm
Item 63	1.4 ... 2.0 Nm
Item 35	1.6 ... 2.3 Nm
Item 652	120 ... 150 Nm

1201325

A6

Mechanical test data

Alternators 0 120 300..., 0 120 339...,

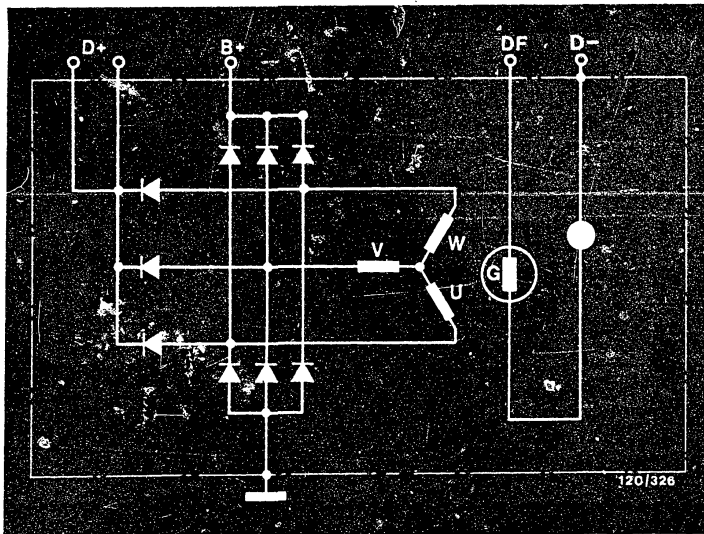


A7

Mechanical test data

Alternators 0 120 300..., 0 120 339...,





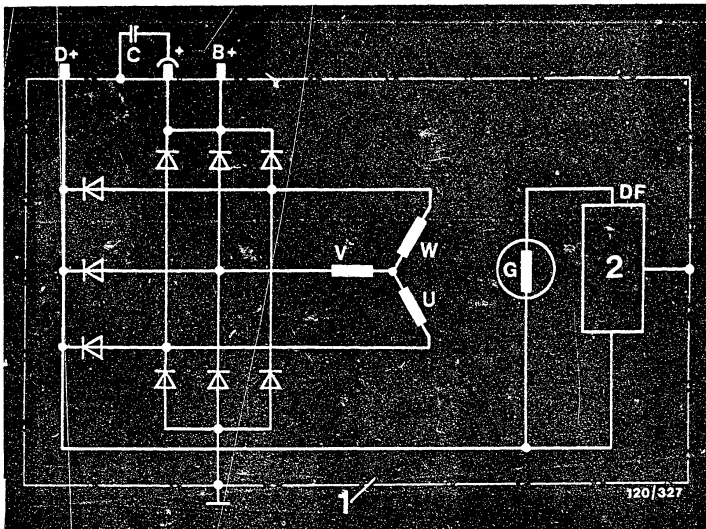
3. Circuit diagram of alternator with separately mounted regulator

A8

Circuit diagram

Alternators 0 120 300..., 0 120 339...,





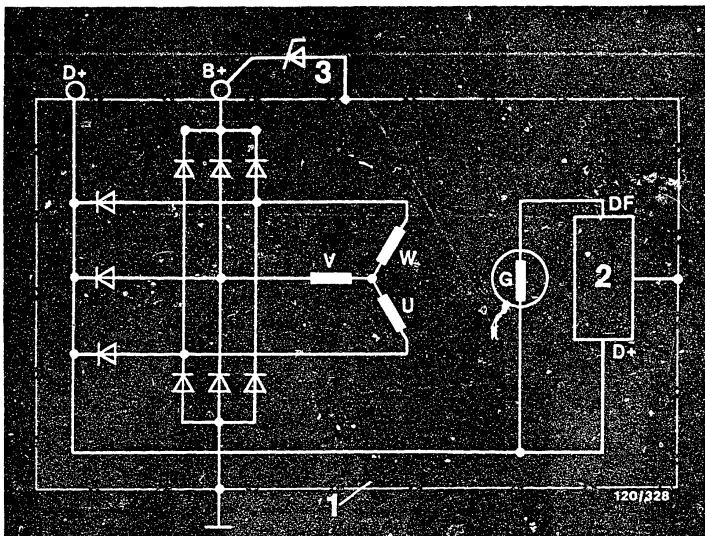
3.1 Circuit diagram of G1 alternator with attached-type regulator

A9

Circuit diagram

Alternators 0 120 300..., 0 120 339...,





- 1 = Alternator
- 2 = Regulator
- 3 = Zener diode

3.2 Circuit diagram of G1 alternators with attached-type regulator and Zener diode (protective diode)

A10

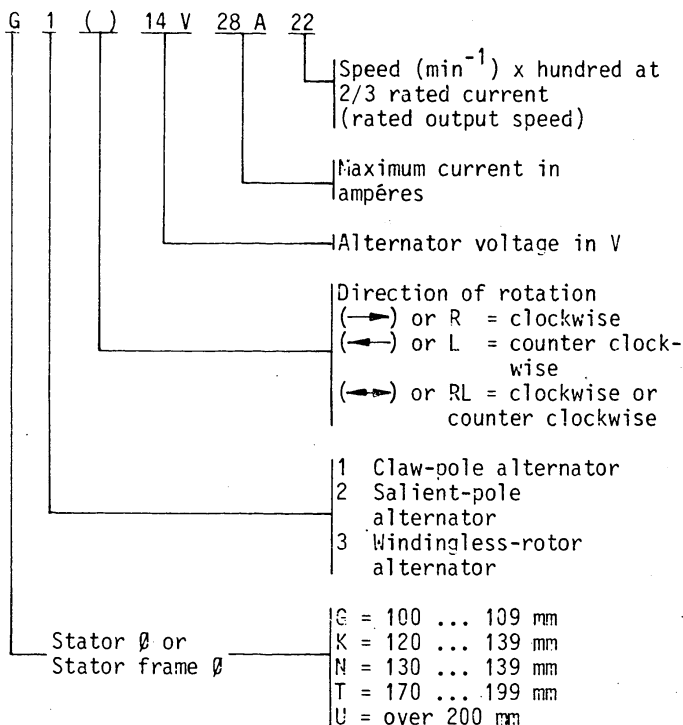
Circuit diagram

Alternators 0 120 300..., 0 120 339...



4. General Instructions

Explanation of type code on alternator



Cleaning the parts

CAUTION! FIRE HAZARD!

Alternators are being increasingly fitted with capacitors of long storage life (e.g. for the interference suppression of receivers and transmitters).

When washing parts of alternators it may happen that when they are dipped in cleaning fluids there is a capacitor discharge which may ignite inflammable fluids. For this reason, parts with capacitors must only be washed in tri or perchloroethylene.

Note:

Alternator 0 120 339 543 was used in preparing these repair instructions.
The various versions of alternator should be taken from the corresponding service-part microfiches.

A12

General information

Alternators 0 120 300.. 0 120 339..



5. Test equipment, tools and adhesives

5.1 Test equipment

	EFLI	0 683 300 100
Alternator test bench	EFLJ 25 ..	0 680 110 ...
	or EFLJ 70 A	0 680 104 ...
or combination test bench (only for loading up to max. 43A)	EFAW 275 ..	0 681 107 ...
Mounting plate	EFLJ 66/3	
for mounting swivel- arm-mounted alternators on alternator test bench	EFLJ 25, 70	
Parts set		1 687 000 042
for mounting swivel-arm- mounted alternators on combination test bench	EFAW 275 ..	

For additional test:

Ignition oscilloscope (all models)

or

Bosch Motortester (all models)



Test equipment (continued)

Test panel	or	EFAW 81 KDAW 9984	0 681 169 013
Transformer panel	or	EFAW 32 KDAW 9985	0 681 169 014
Insulation tester		EFAW 84	(Included with EFAW 81 and KDAW 9984)
Dial indicator		EFAW 7	1 687 233 011
Magnetic instrument stand		T-M1 (EW/MS 1 B 1	4 851 601 124 0 601 980 001)
Alternator tester		EFAW 192 or WPG 012.00	0 681 101 403 0 634 201 200
3 Feeler gauges 0.15 ... 0.6 mm		KDZV 7399	
Electric tester		ETE 014.00	0 684 101 400



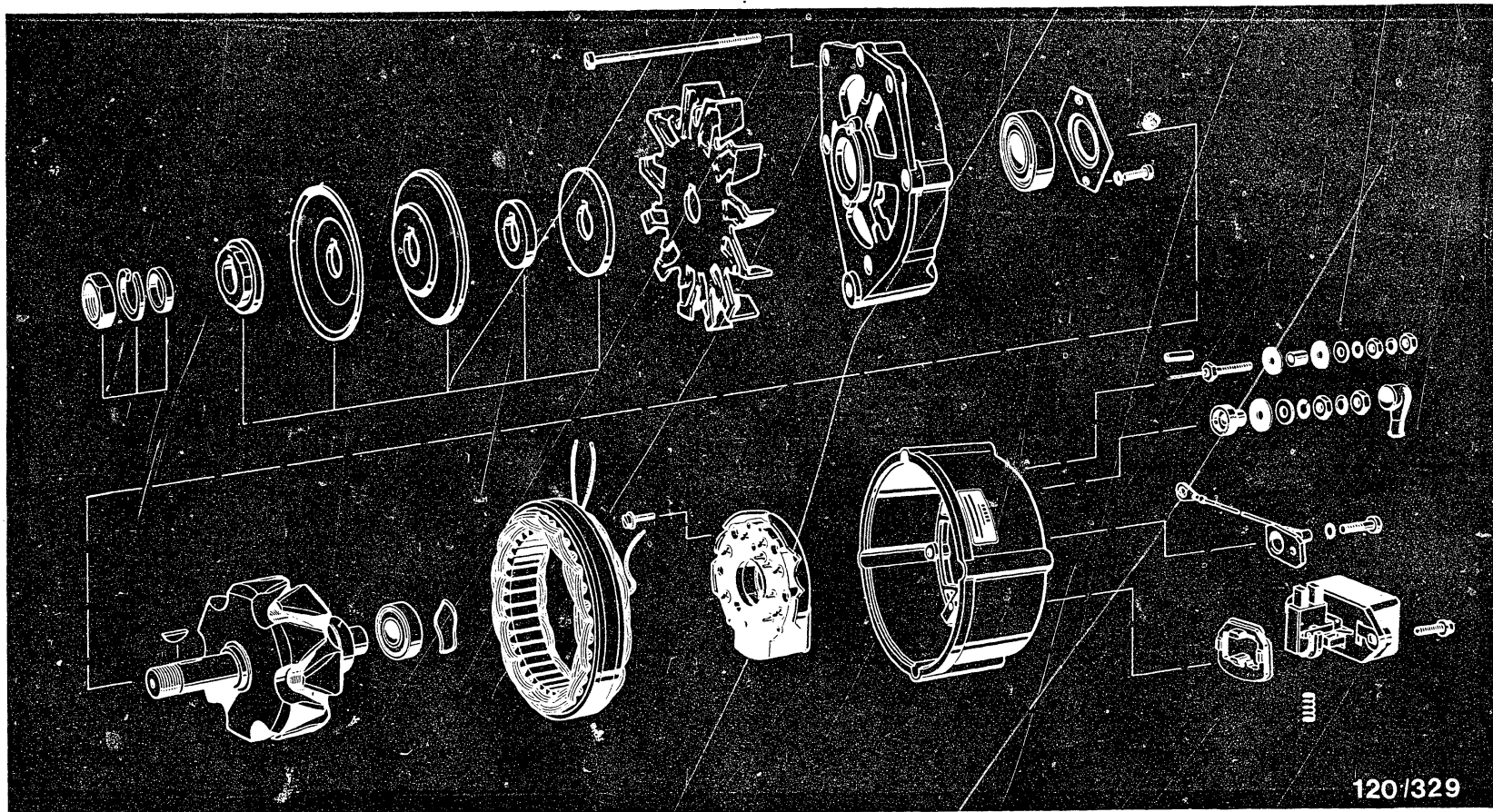
5.2 Tools

Mandrel	KDLI 6002 6015 6018 or 6021
Mandrel for the collector rings	KDLI 6004/1 and 6004/0/1
Holding mechanism for pulley	KDLI 6006
Clamping pin for arbor press	KDLI 6010
Mandrel for collector-ring end shield	KDLI 6499/0/3
Clamping support	KDAW 9999
Arbor press	(commercially available)
Two V-supports	(commercially available)
Soldering iron 180 W	(commercially available)
Puller for collector rings	(commercially available)
Punch	(commercially available)
Press-out ring, e.g. old starting- motor stator frame	
ID 105 mm	
OD 115 mm	

5.3 Adhesives

Dispersion binder KK 57 v 1	5 703 151 000
-----------------------------	---------------





120/329

6. Exploded view

Alternator 0 120 3 ...

A16

Exploded view

Alternators 0 120 300..., 0 120 339...,

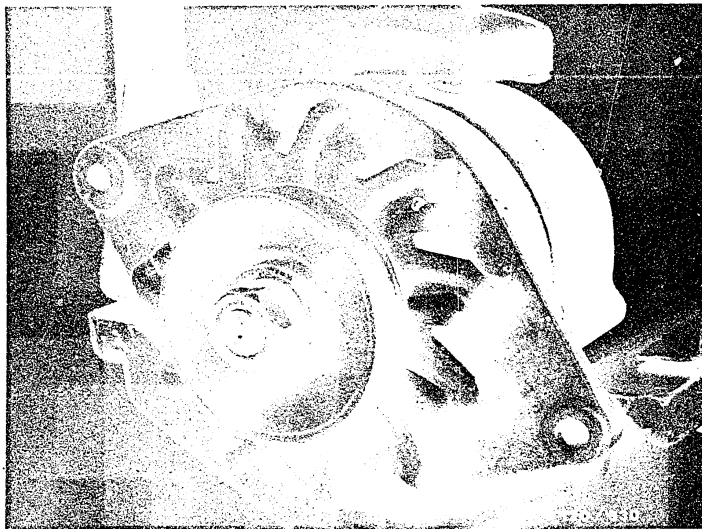


A17

Exploded view

Alternators 0 120 300..., 0 120 339...,





7. Dismantling the alternator and testing the parts

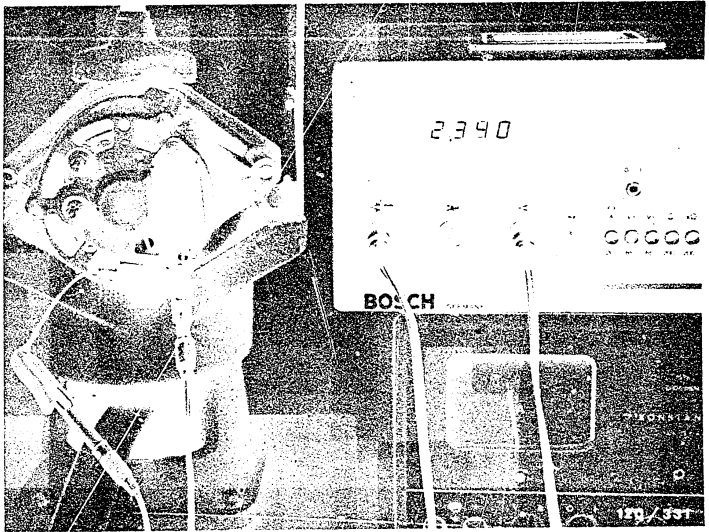
Clamp the alternator in clamping support KDAW 9999.

B1

Dismantling the alternator

Alternators 0 120 300..., 0 120 339...,



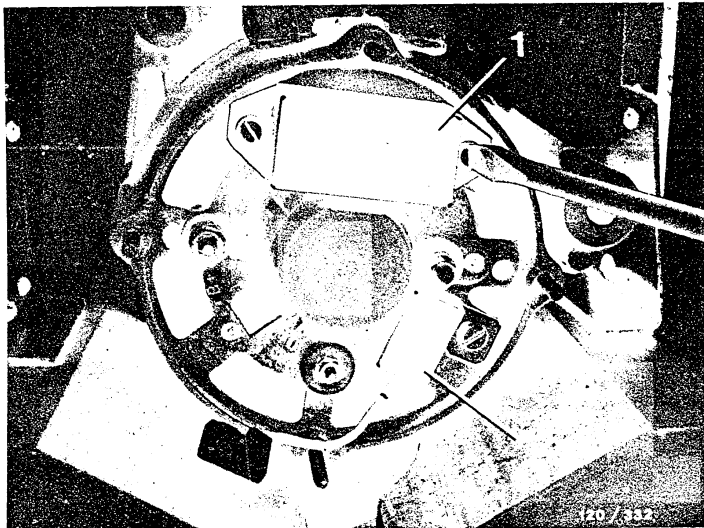


9.2 Testing the suppression capacitor

Remove lead of suppression capacitor from terminal B+.
Connect electric tester between lead of suppression capacitor and terminal B- of alternator (picture).
Set value: 1.8 ... 2.6 μ F.

If this value is not reached, replace the defective suppression capacitor. After testing, discharge the suppression capacitor by short-circuiting so that there is no possibility of the cleaning liquid igniting when the parts are cleaned.





- 1 = Electronic regulator with carbon-brush holder
2 = Capacitor

Caution!

Before further dismantling the alternator, first of all remove the electronic regulator (see Fig.). To do this, unscrew the 2 fastening screws on the regulator.

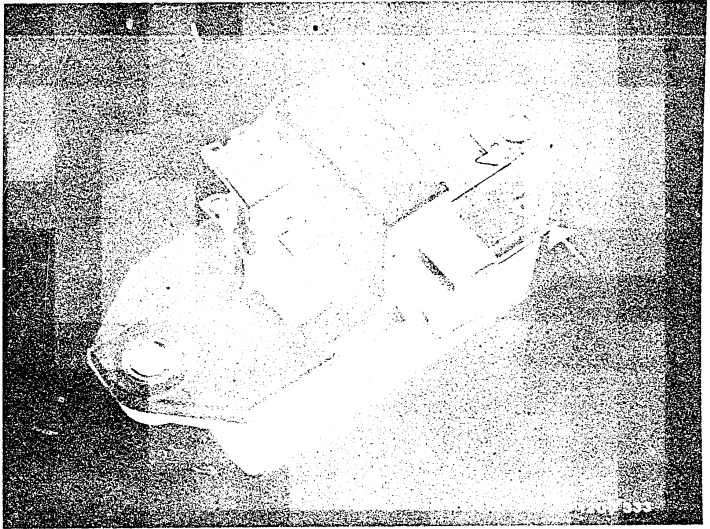
If this sequence of operations is not followed, the carbon brushes will break when the alternator is taken apart.

B3

Dismantling the alternator

Alternators 0 120 300.., 0 120 339..,





7.2 Testing the regulator for external damage and replacing the carbon brushes

If carbon brushes are broken off, or if the projection dimension "a" is less than 7 mm, replace the carbon brushes.

Observe dimension "a" when soldering in the new carbon brushes.

Alternators	Collector ring dia. (mm)		Brush projection (mm)	
	new	min. dia.	new	min.
0 120 3..	27.8	26.8	10	5.0

Note: Solder (colophonium tin only) must not flow into copper strand. Silicon tubing over copper strand must be clamped next to the solder joint.

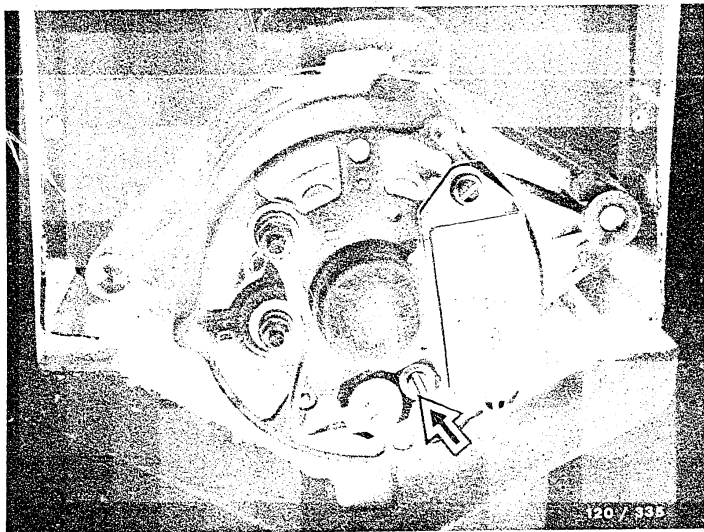
Check carbon brushes for freedom of movement after installing.

B4

Dismantling the alternator

Alternators 0 120 300.., 0 120 339..,





7.3 Testing the unidirectional-breakdown diode (if installed instead of a capacitor)

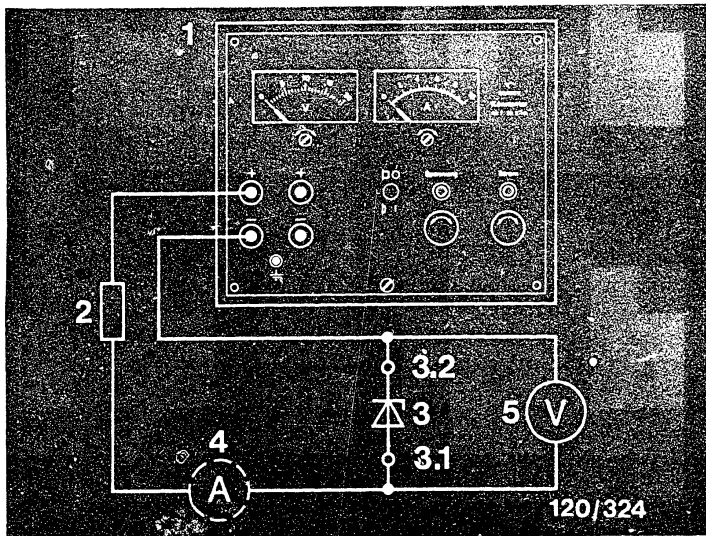
Remove the unidirectional-breakdown diode (arrow). Check for external damage (burned connecting lead, destroyed unidirectional-breakdown diode). If unidirectional-breakdown diode does not show any external damage, test the forward and reverse directions with a voltage stabilizer. Using voltage stabilizer, test the forward and reverse directions.

B5

Dismantling the alternator

Alternators 0 120 300.., 0 120 339..





- | | |
|------------------------------------|-----------------|
| 1 = Voltage stabilizer | 3.2 = Connector |
| 2 = Resistor 10 Ω 5 W | (cathode) |
| 3 = Unidirectional-breakdown diode | 4 = Ammeter |
| 3.1 = Heat sink (anode) | 5 = Voltmeter |

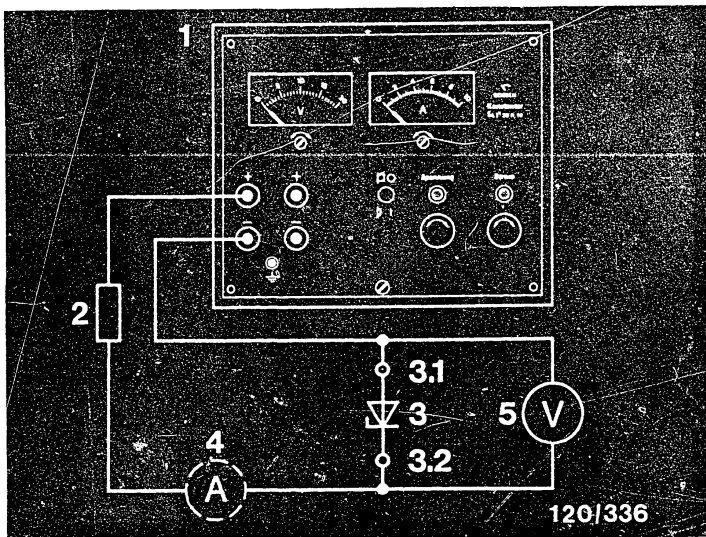
Testing the forward direction

Connect the unidirectional-breakdown diode to the voltage stabilizer as shown in the diagram. Set the voltage at the voltage stabilizer to 6.0 V. Set the current at the voltage stabilizer to 0.5 A. If voltage 1.0 V is indicated on the voltmeter, the unidirectional-breakdown diode is O.K.

Note:

If the scale on the ammeter of the voltage stabilizer is too big, then install an additional ammeter in the circuit in series with the resistor.





- | | |
|---------------------------------------|------------------------------|
| 1 = Voltage stabilizer | 3.2 = Connector
(cathode) |
| 2 = Resistor 10Ω 5 W | 4 = Ammeter |
| 3 = Unidirectional-breakdown
diode | 5 = Voltmeter |
| 3.1 = Heat sink (anode) | |

Testing the reverse direction

Short-circuit the voltage stabilizer and set the current to 0.5 A.

Remove the short circuit and switch off the voltage stabilizer. Do not change the setting of the current regulator when doing this. Connect the unidirectional-breakdown diode to the voltage stabilizer as shown in the diagram. Slowly increase the voltage.

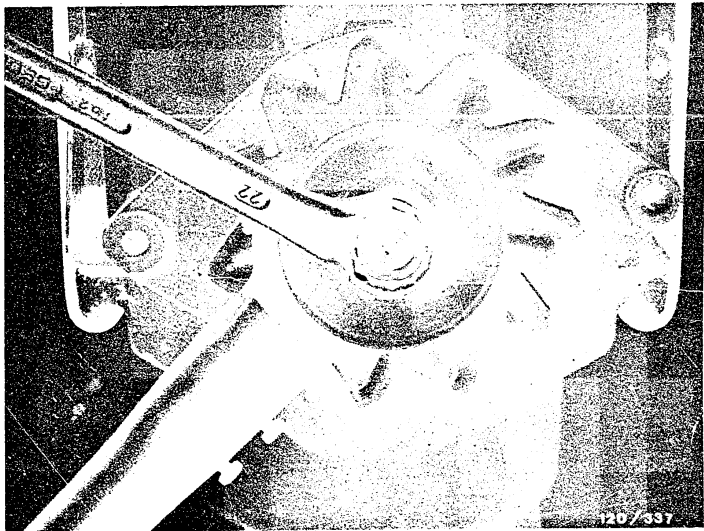
If, at 18 V, the ammeter still indicates no current and if the current between 20 and 24 V is 0.5 A, the unidirectional-breakdown diode is O.K.

B7

Dismantling the alternator

Alternators 0 120 300.., 0 120 339..,





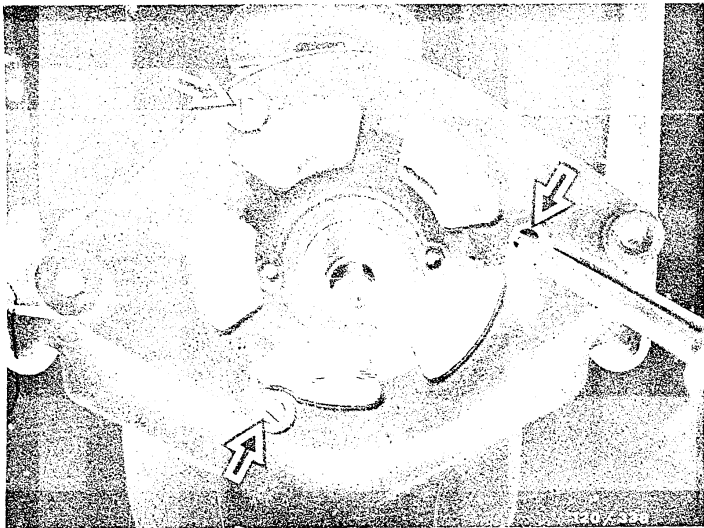
Using holding tool KDLI 6006 and 22 mm open-end wrench, loosen fastening nut and remove pulley with fan.

B8

Dismantling the alternator

Alternators 0 120 300..., 0 120 339...,





Caution

Before the alternator is further dismantled, mark the drive end shield, collector-ring end shield and stator so that these parts are brought into the same position again when assembling.

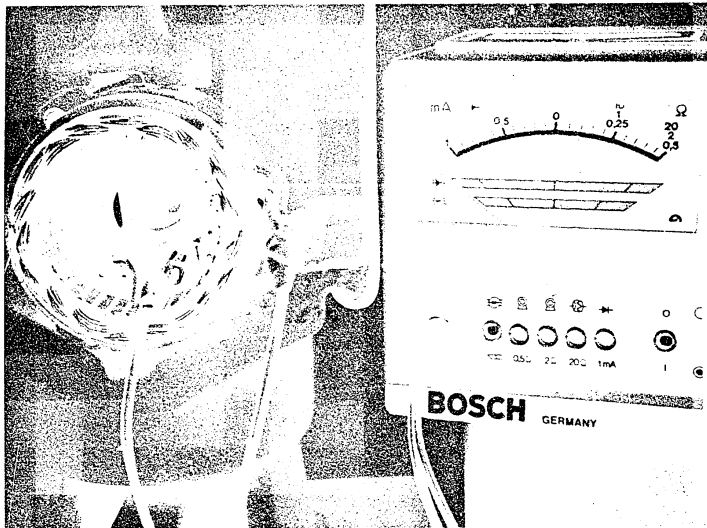
Loosen three fillister-head screws (arrows) and remove. Withdraw drive end shield with rotor from collector-ring end shield.

B9

Dismantling the alternator

Alternators 0 120 300..., 0 120 339...,





7.4 Testing the rectifier

Test the proper operation of the rectifier when connected up using EFAW 192 or WPG 012.00. Capacitor not connected. Note switch position on tester.

Test points:

Housing and winding ends

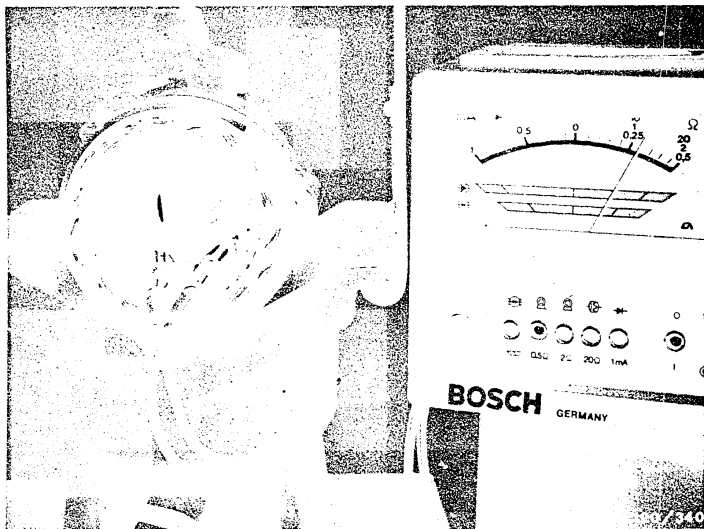
B+ and winding ends

D+ and winding ends

Rectifier is OK if the pointer of the tester is in the green area when testing.

If one or more diodes are defective, replace the complete rectifier.





9.4 Testing the stator (resistance)

With the stator installed, test its resistance (picture).

Note switch position on tester.

Alternators 0 120 3..	Resistance ²⁾ Ω + 10%
G1 (RL) 14V13A15	0.83
G1 (RL) 14V15A20	0.40
G1 (RL) 14V18A20	0.40
G1 (RL) 14V24A23	0.4
G1 (RL) 14V28A22	0.27
G1 (RL) 14V30A23	0.26
G1 (RL) 14V33A27	0.28
G1 (RL) 28V19A25	0.83

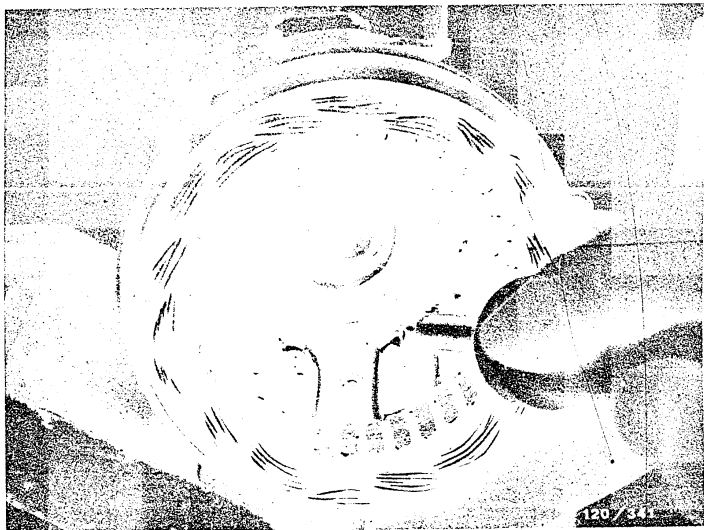
²⁾ Between the phase outlets

B11

Dismantling the alternator

Alternators 0 120 300.., 0 120 339..,





Removing the stator

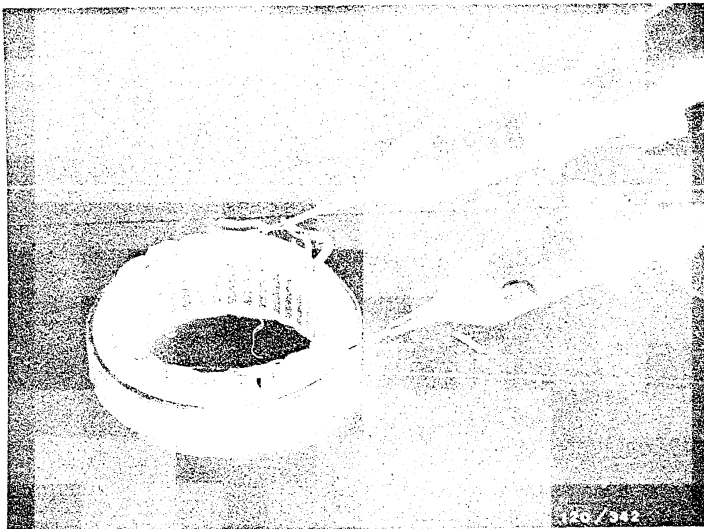
Remove solder from the phase connections using soldering iron or soldering gun. Using a screwdriver, straighten the ends of the leads and pull the leads out of the fastening holes.

B12

Dismantling the alternator

Alternators 0 120 300.., 0 120 339..,





7.6 Testing the stator (short circuit to ground)

Using test prods EFAW 84 or KDAW 9983 test the stator for short circuit to ground (see picture).

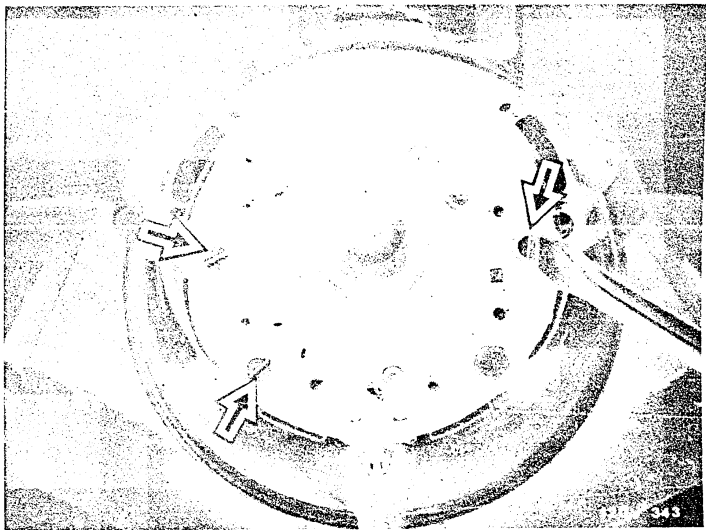
Test voltage 80 V a.c.

B13

Dismantling the alternator

Alternators 0 120 300..., 0 120 339...





Removing the rectifier

Remove 3 washer-and-screw assemblies on inside of rectifier (picture).

Unsolder terminal W (arrow).

Loosen terminal studs B+, B- and D+ on outside of collector-ring end shield. If terminal W fitted, loosen this also. They are rigidly mounted on the rectifier.

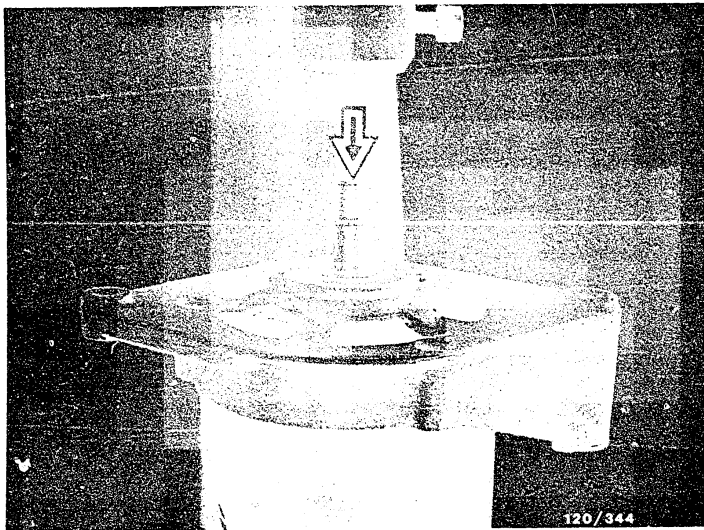
Withdraw rectifier from collector-ring end shield.

B14

Dismantling the alternator

Alternators 0 120 300., 0 120 339.,





Pressing-out the claw-pole rotor

The claw-pole rotor need only be pressed out if one of the following parts is defective:
Collector rings or excitation winding, drive end shield or deep-groove ball bearing.

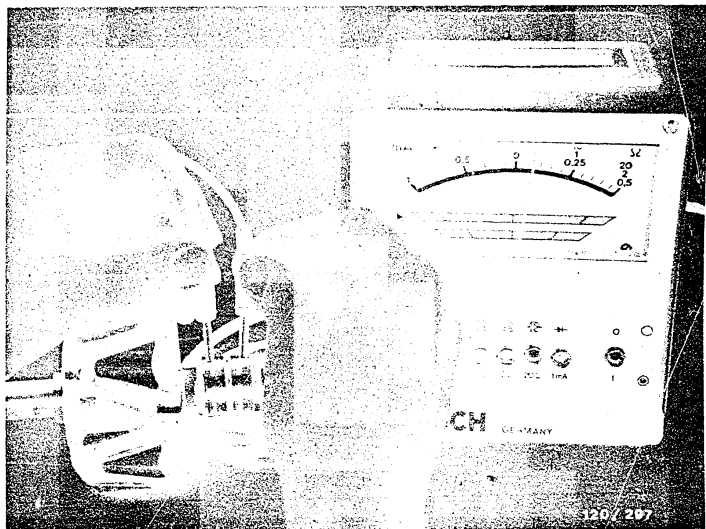
Place drive end shield on press-out mandrel (Fig.).
Force out claw-pole rotor using suitable press-in mandrel.

B 15

Dismantling the alternator

Alternators 0 120 300.., 0 120 339..,





7.7 Testing the resistance of the rotor

Measure resistance of rotor using alternator tester or electric tester ETE 014.00.

Alternators 0 120 3..

	Resistance $\Omega + 10\%$
G1 (RL) 14V13A15	9.0
G1 (RL) 14V15A20	6.5
G1 (RL) 14V18A20	5.5
G1 (RL) 14V24A23	4.0 ⁵⁾
G1 (RL) 14V28A22	4.0 ⁵⁾
G1 (RL) 14V30A23	4.0 ⁵⁾
G1 (RL) 14V33A27	4.0 ⁵⁾
G1 (RL) 28V19A25	9.0

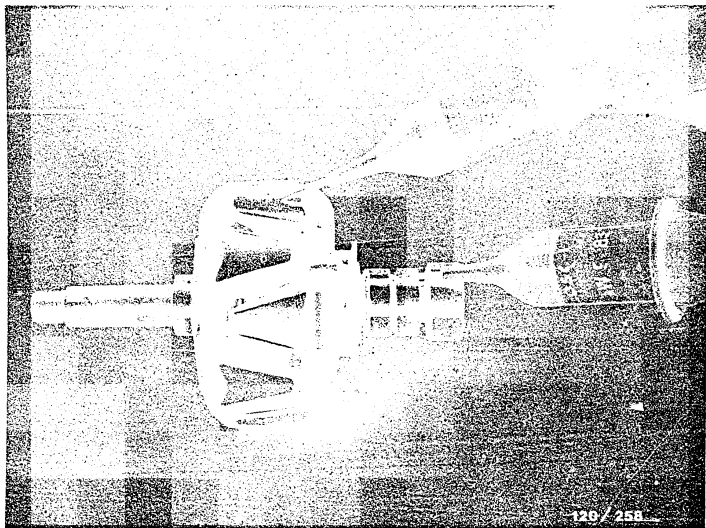
5) For alternators with transistor regulator $R = 3.4$
or 2.9Ω

B 16

Dismantling the alternator

T1 alternators 0 120 300.., 0 120 339..,





7.8 Testing the rotor for short-circuit to ground

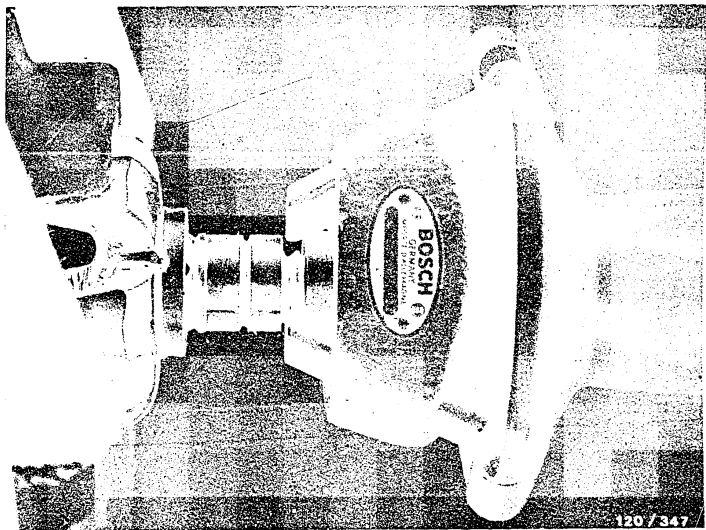
Test the rotor for a short-circuit to ground using test prods EFAW 84 or KDAW 9983.
Test voltage 80 V AC.

B17

Dismantling the alternator

Alternators 0 120 300..., 0 120 339...,





Removing the deep-groove ball bearing on the collector-ring side

Clamp the stator in the clamping support KDAW 9999. Pull off the deep-groove ball bearing with a commercially available puller (Fig.).

B 18

Dismantling the alternator

Alternators 0 120 300..., 0 120 339...,





7.9 True-running test

Mount the journals of the rotor in the V-supports and align exactly horizontal. Carry out true-running test on outside diameter of rotor (see arrow) and on outside diameter of the collector rings (picture) using magnetic instrument stand T-M1 (4 851 601 124) and dial indicator EFAW 7.

Maximum error on rotor 0.05 mm.

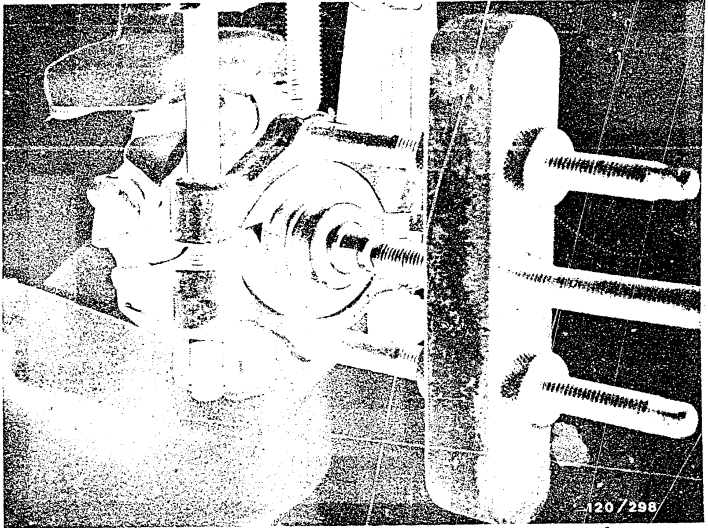
Maximum error on collector rings 0.03 mm.

If error is greater, skim collector rings.

Minimum diameter of collector rings.

Alternator 0 120 3..	new	min. dia
	27.8 mm	26.6 mm





Removing the collector rings

Unsolder the leads of the excitation winding from the collector rings. Using a commercially available puller, remove the collector rings from the rotor shaft (picture).

B20

Dismantling the alternator

Alternators 0 120 300..., 0 120 339...,



8. Cleaning the parts

CAUTION! FIRE HAZARD!

Alternators are being increasingly fitted with long-storage capacitors (e.g. for the interference suppression of receivers and transmitters).

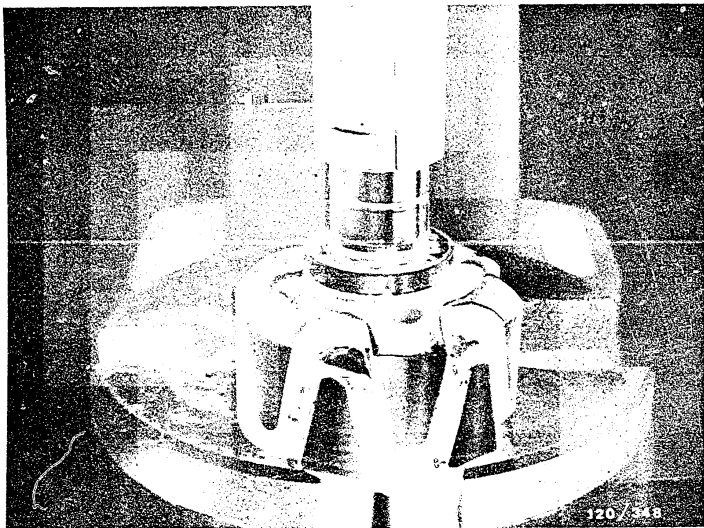
When washing parts of the alternator it is possible for the capacitor to discharge when immersed in cleaning fluids, there then being the danger that inflammable liquids will ignite. For this reason, parts with capacitors must only be washed in tri- or perchloroethylene.

B21

Cleaning the parts

Alternators 0 120 300 ... 0 120 339





9. Assembling the alternator

Pressing on the collector rings

Place the collector rings on the rotor shaft. Introduce one lead from the excitation winding into the groove in the collector rings. Then press on collector rings as far as they will go using press-on tool KDLI 6004/1 and 6004/0/1. When doing this, position the groove of the press-on tool so that the lead of the excitation winding which is guided through the collector rings is visible.

Solder the wire leads of the excitation winding. Turn down the soldered joint on both collector rings until the collector rings are no longer uneven.

C1

Assembling the alternator

Alternators 0 120 300..., 0 120 339...,





Pressing on the deep-groove ball bearing on the collector ring end

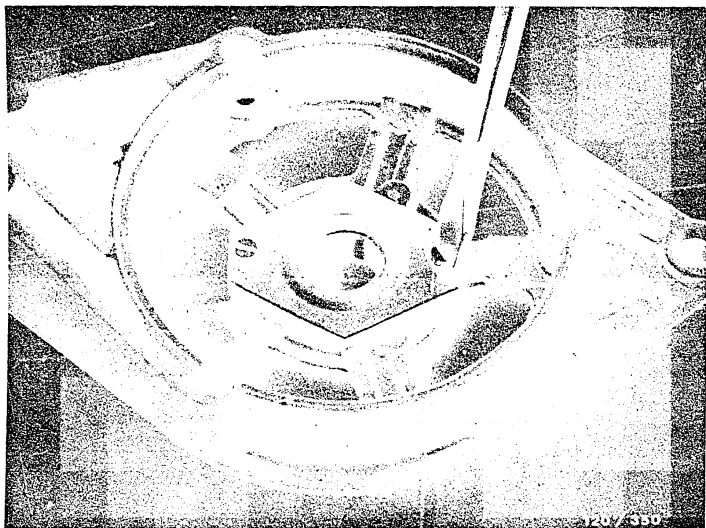
Place a new deep-groove ball bearing on the rotor shaft and press on as far as it will go using press-on mandrel KDLI 6002 (picture).

C2

Assembling the alternator

Alternators 0 120 300.., 0 120 339..





Assembling the drive-end-bearing housing

Introduce a new deep-groove ball bearing into the drive-end-bearing housing. Mount a new cover plate with 2 fillister-head screws. Tightening torque for the fillister-head screws 2.4...3.5 Nm.

C3

Assembling the alternator

Alternators 0 120 300..., 0 120 339...





Pressing the rotor into the drive-end-bearing housing

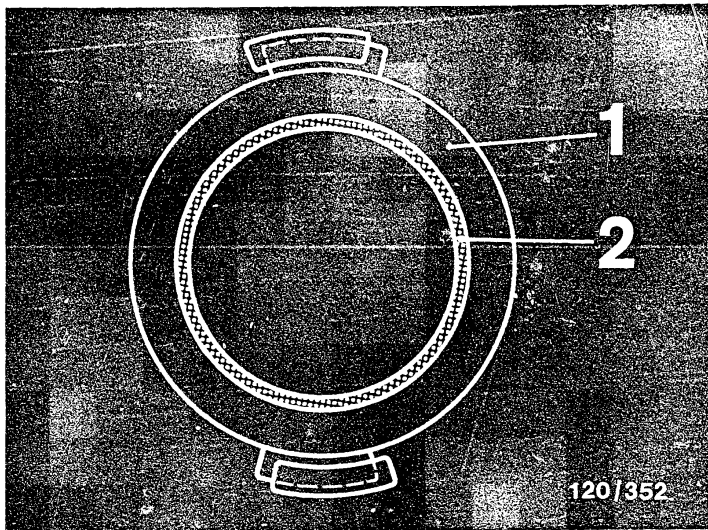
Introduce the rotor into the drive-end-bearing housing. Insert spacer ring on outside in drive-end-bearing housing. Place drive-end-bearing housing on KDLJ 6018. Insert press-in mandrel KDLJ 6015 into arbor press and press rotor into drive-end-bearing housing (see picture).

C4

Assembling the alternator

Alternators 0 120 300..., 0 120 339...





- 1 = Cover ring
2 = Felt washer

Replacing the felt washer

On dust-proof G1 alternators, to ensure that the collector-ring space is correctly sealed again after repairs, it is necessary to replace the felt washer in the diode plate.

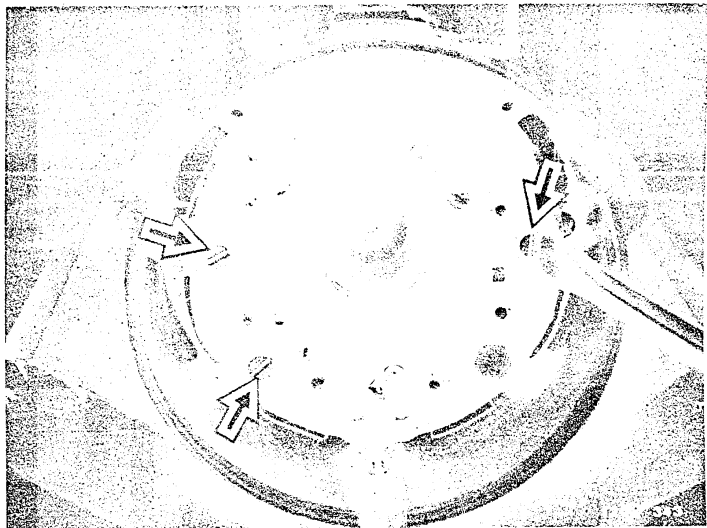
Turn the cover ring (bayonet catch) and remove. Replace the felt washer. Reposition the cover ring and lock.

C5

Assembling the alternator

Alternators 0 120 300.., 0 120 339..,





Screw down the rectifier on the alternator end with 3 washer-and-screw assemblies (picture) depending on the version of alternator.

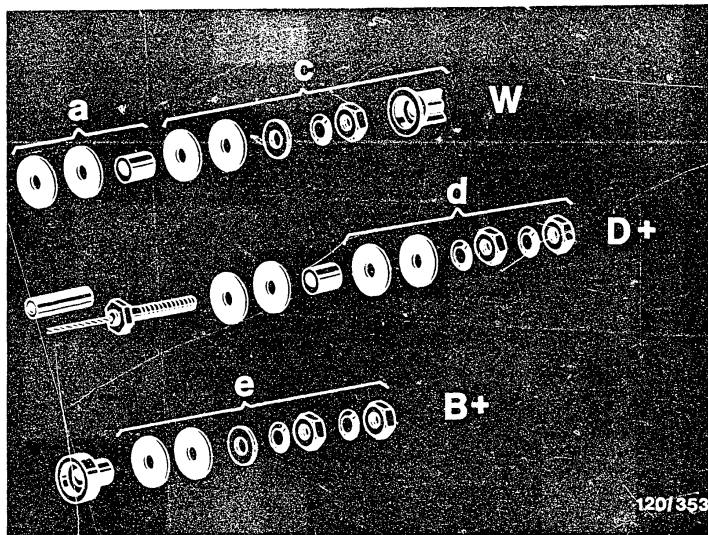
Tightening torque for the washer-and-screw assemblies:
1.4...2.0 Nm.

C6

Assembling the alternator

Alternators 0 120 300..., 0 120 339...,





Fasten the rectifier at the terminal end using parts c, d, e.

Tightening torques:

Parts c,d,e = upper nut 2.7 ... 3.8 Nm

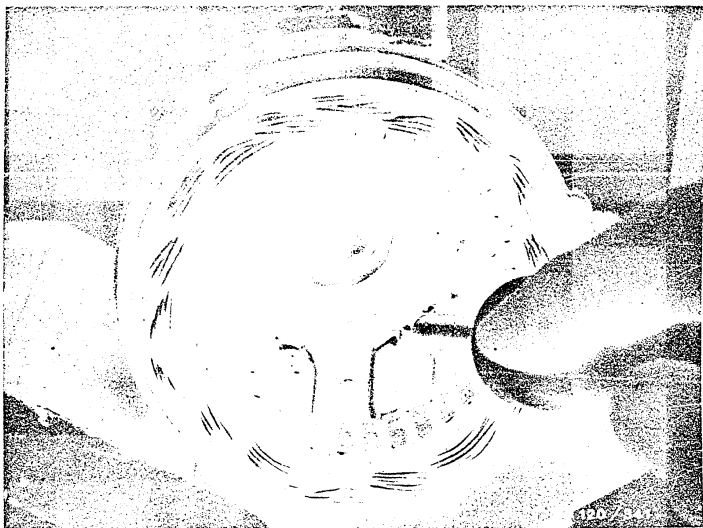
Parts c,d,e = lower nut 2.9 ... 4.1 Nm

C7

Assembling the alternator

Alternators 0 120 300..., 0 120 339...,





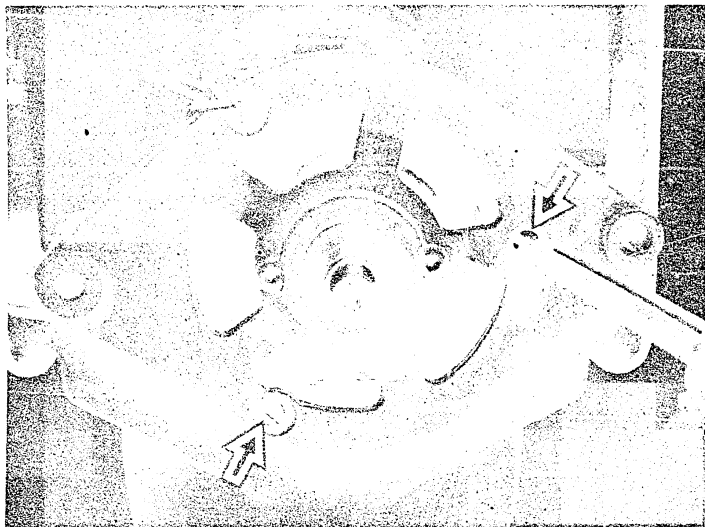
Fitting the stator and the rotor

Place the stator against the rectifier bearing. Bring the markings on the collector-ring end shield and stator (made before dismantling the alternator) into alignment.

Solder on the connection wires of the stator (see picture). When doing this, make sure that the connection wires will not afterwards touch against the rotor. Carefully introduce rotor with drive end shield so that the roller bearing and the radial seal are not altered in their position. If felt ring is fitted, continually turn the rotor.

Note: When soldering the stator do not use too much solder. Excess solder can cause short-circuits.



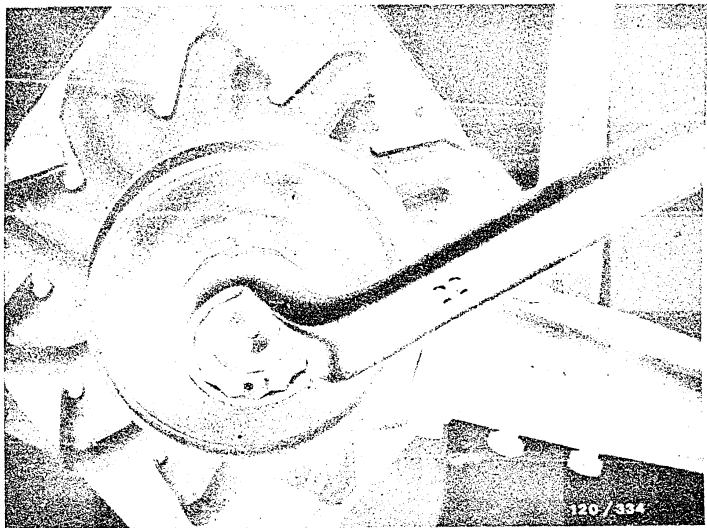


Screwing together the drive-end-bearing housing and the collector-ring end shield

To obtain correct true-running of the rotor, the following operations are necessary:
Stick three feeler gauges between stator and rotor, thickness 0.22 mm.

Using a screwdriver, tighten the 3 fillister-head screws to a tightening torque of 4.1...5.5 Nm.





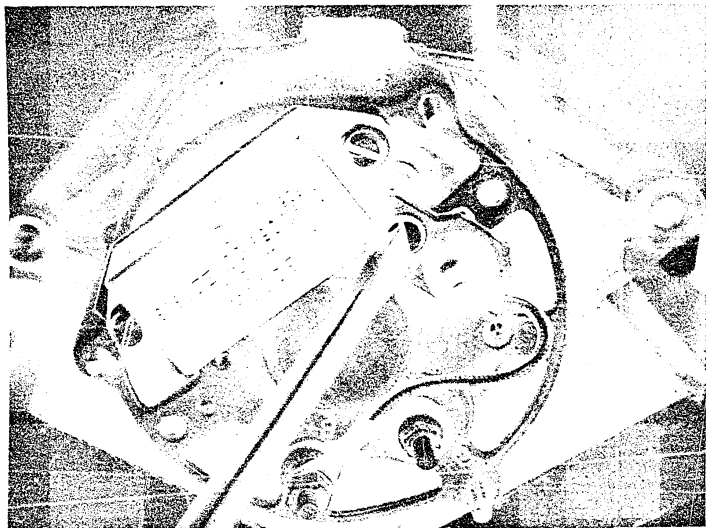
Insert wedge horizontally into groove. Slip the fan, right way round, onto the rotor shaft. Assemble the pulley in the correct sequence and tighten the pulley using holding device KDLJ 6006 and 22 mm box wrench. Tightening torque 35...45 Nm.

C10

Assembling the alternator

Alternators 0 120 300..., 0 120 339...,





Fitting the regulator

Introduce the regulator into the collector-ring end shield and screw onto the rectifier end shield.

Tightening torque for the screws:

1.6 ... 2.3 Nm

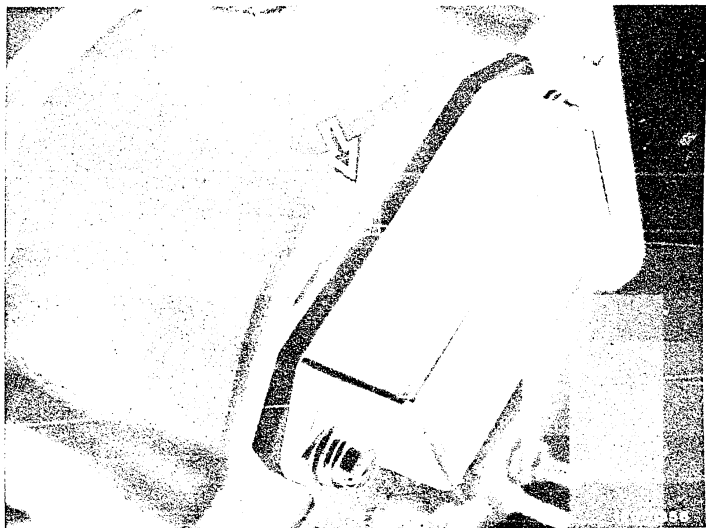
Screw on the suppression capacitor or Zener diode (Fig.).

Tightening torque for the fastening screws:

2.9 ... 4.1 Nm.

Connect the capacitor or Zener-diode connection to terminal B+ of the alternator.





Installing the regulator on dust-proof alternators

Introduce the regulator with gasket (arrow) into the collector-ring end shield. Fit the gasket precisely into the form fit on the collector-ring end shield. Screw on the regulator with 2 fastening screws. Tightening torque for the fastening screws: 1.6...2.3 Nm.

Screw on the capacitor or unidirectional-breakdown diode. Tightening torque for fastening screw: 2.9...4.1 Nm. Connect connecting lead to B+ of alternator.

C12

Assembling the alternator

Alternators 0 120 300..., 0 120 339...,



10. Testing the alternator with regulator on the test bench

10.1 Test equipment and devices

Alternator test bench	or	EFLI91	0 683 300 100
		EFLJ25 ..	0 680 110 ...
	or	EFLJ70 A	0 680 104 ...
or combination test bench (only for loading up to max. 43 A)		EFAW 275 ..	0 681 107 ...
Mounting plate for mounting swivel-arm- mounted alternators on alternator test bench		EFLJ 66/3	
		EFLJ 25, 70	
Parts set for mounting swivel-arm- mounted alternators on combination test bench			1 687 000 042
Alternator tester		EFAW 275 ..	
For additional test:		WPG 012.00	0 681 101 403
Ignition oscilloscope		(all models)	
or			
Bosch Motortester		(all models)	



Mounting on the test bench

Swivel-arm-mounted or flange-mounted alternators must only be mounted on the test bench using the appropriate clamping fixture.

So that the power of the test-bench motor is sufficient, only test using the appropriate fan and pulley. Select the correct transmission ratio.

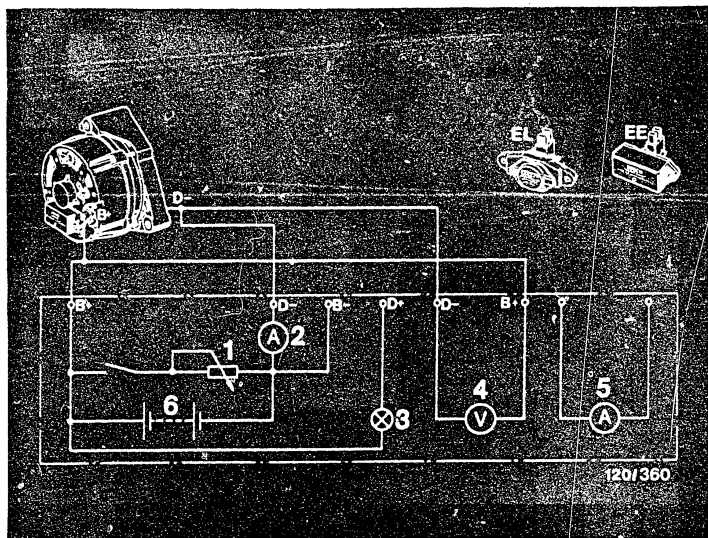
For test bench EFLJ 25 .. the transmission ratio is 0.3:1. This means: If the alternator pulley is, for example, 100 mm \emptyset , use test-bench pulley with 350 mm \emptyset .

For test bench EFLJ 70A the transmission ratio is 0.4:1. This means: If the generator pulley is, for example, 100 mm \emptyset , use test-bench pulley with 250 mm \emptyset .

Note: If, at very high alternator outputs, the drive power of the test-bench motor is not sufficient, then only carry out the test to the extent that the test speed does not drop at the required test current.

The charge indicator lamp must be completely out when power-testing.





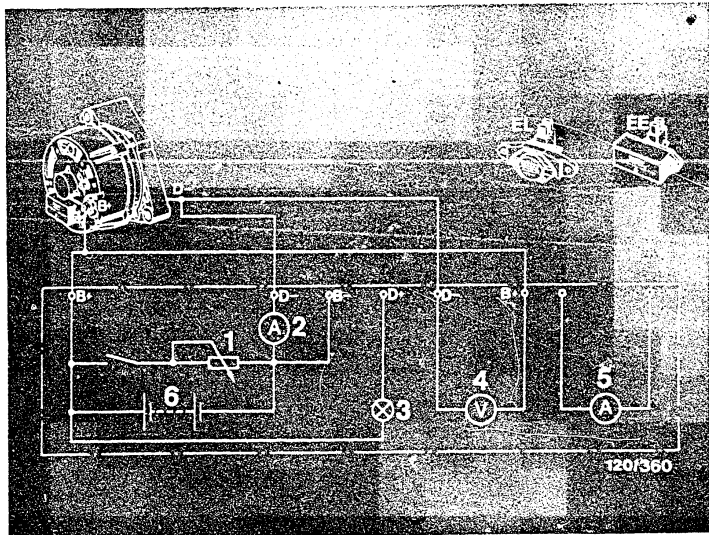
- | | |
|----------------------|-----------------------------------|
| 1 = Loading resistor | 4 = Voltmeter (regulated voltage) |
| 2 = Ammeter | 5 = Ammeter |
| 3 = Indicator lamp | 6 = Test-bench battery |

Connecting the alternator to the test bench

Connect the positive battery cable of the test bench to B+ of the alternator.

If the clamping table on the test bench is used as a ground cable, make sure that there are no contact resistances. It is therefore advisable in the case of high-power alternators to connect the negative battery cable of the test bench directly to the alternator. Connect voltmeter between B+ and B-.





- | | |
|----------------------|-----------------------------------|
| 1 = Loading resistor | 4 = Voltmeter (regulated voltage) |
| 2 = Ammeter | 5 = Ammeter |
| 3 = Indicator lamp | 6 = Test-bench battery |

Important:

ALL connections on the test bench must be properly made. When the alternator is running the connection between alternator and battery must not be disconnected since, otherwise, the semiconductors in the alternator and regulator may be destroyed.

Do not operate the alternator without the battery being connected.

If a direction of rotation is marked on the fan wheel or on the alternator, then the alternator must only be driven in this direction of rotation.



Power testing

Note: When power testing, ensure that the current-limiting resistor built into the test bench is not connected into the circuit since, otherwise, the charge indicator lamp glows and gives the impression that there is a fault in the alternator.

For testing, the alternator is brought up to operating temperature on the test bench (approx. 60°C).

Do this at a speed of 2000 min⁻¹.

Increase load current to above the maximum value until the voltage begins to drop.

Power testing with regulator

First of all, bring the alternator up to the stated test speed. Then adjust the loading resistor until the stated current is reached. The indicated voltage must not exceed 13V, or 26V, over the complete speed range.

D5

Testing

Alternators 0 120 300..., 0 120 339...,



Power test with regulator (continued)

Alternators 0 120 3..	Power test Speed min ⁻¹	Load current A
G1 (RL) 14V13A15	1100	5
	1500	8
	7000	13
G1 (RL) 14V15A20	1450	5
	2000	10
	6000	15
G1 (RL) 14V18A20	1350	5
	2000	12
	6000	18
G1 (RL) 14V24A23 ⁴⁾	1350	5
	2300	16
	7000	24
G1 (RL) 14V28A22	1500	10
	2200	18
	7000	28
G1 (RL) 14V30A23	1200	2
	2300	20
	7000	30
G1 (RL) 14V33A27	1600	10
	2700	22
	7000	33
G1 (RL) 28V19A25	1400	3.5
	2500	13
	7000	19

D6

Testing

Alternators 0 120 300..., 0 120 339...,

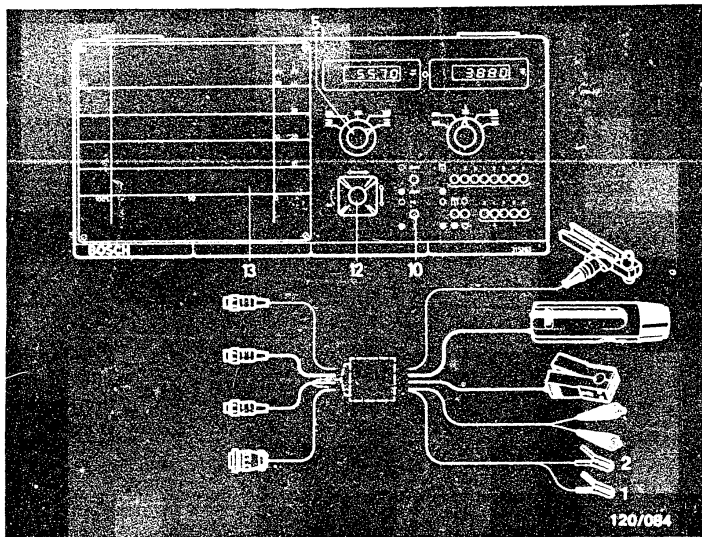


Testing the regulated voltage

Bring the alternator to a speed of 6000 min^{-1} . Test the regulator to see whether it operates in the range of the regulated voltage.

Part number of regulator	Type code	Regulated voltage V	Load current A
0 192 052 015	EE14V3	13.7...14.5	} ≤ 10
0 192 052 016	EE14V3	13.7...14.5	
0 192 052 020	EE14V3	13.7...14.5	
0 192 052 021	EE14V3	13.7...14.5	
0 192 052 027	EE14V3	13.7...14.5	
0 192 052 028	EE14V3	13.7...14.5	
0 192 052 029	EE14V3	13.7...14.5	
1 197 311 003	EL14V4C	13.7...14.5	
1 197 311 004	EL14V4C	13.7...14.5	
1 197 311 005	EL14V4C	13.7...14.5	
1 197 311 006	EL14V4B	13.7...14.5	
1 197 311 007	EL14V3C	14.1...14.9	
1 197 311 008	EL14V3C	14.1...14.9	
1 197 311 009	EL14V4B	13.7...14.5	
1 197 311 010	EL14V4B	13.7...14.5	
1 197 311 011	EL14V4C	13.7...14.5	
0 192 053 001	EE28V3	27.6...28.4	≤ 10





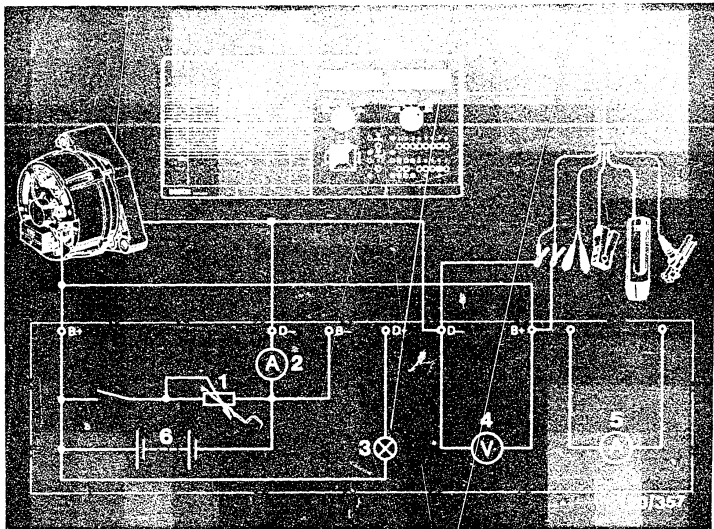
10.2 Testing with the oscilloscope

Connect oscilloscope (MOT 002.00) to the alternator using corresponding test lead.

Red clip (1) to terminal D+.

Black clip (2) to terminal B- (ground).





- | | |
|--------------------|----------------------|
| 1 Loading resistor | 4 Voltmeter |
| 2 Ammeter | (regulated voltage) |
| 3 Indicator lamp | 5 Ammeter |
| | 6 Test bench battery |

10.2.1 Functional test of unidirectional-breakdown diode on the alternator test bench

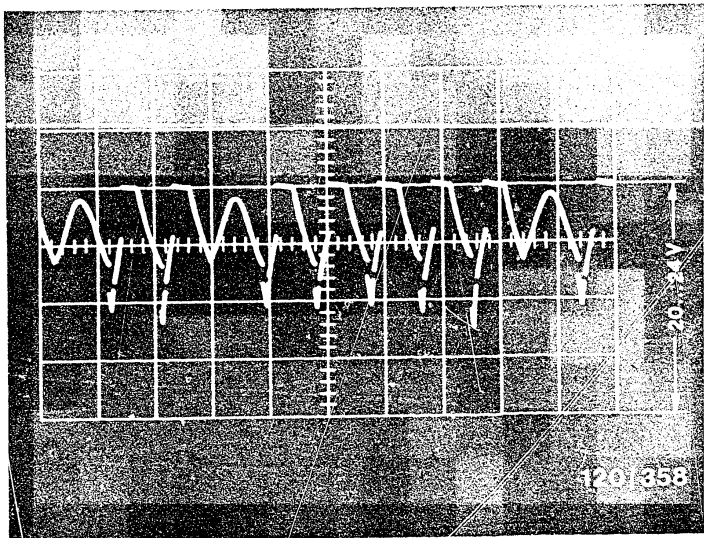
Clamp the alternator on the alternator test bench with the unidirectional-breakdown diode mounted, and connect the oscilloscope.

See diagram for test circuit.

Connect anode (heat sink) of unidirectional-breakdown diode to D-, and cathode (connecting lead) of unidirectional-breakdown diode to B+.

Drive the alternator at a speed of 6000 min^{-1} . Disconnect the battery and set the alternator current to the current given on the alternator, but maximum 35A.





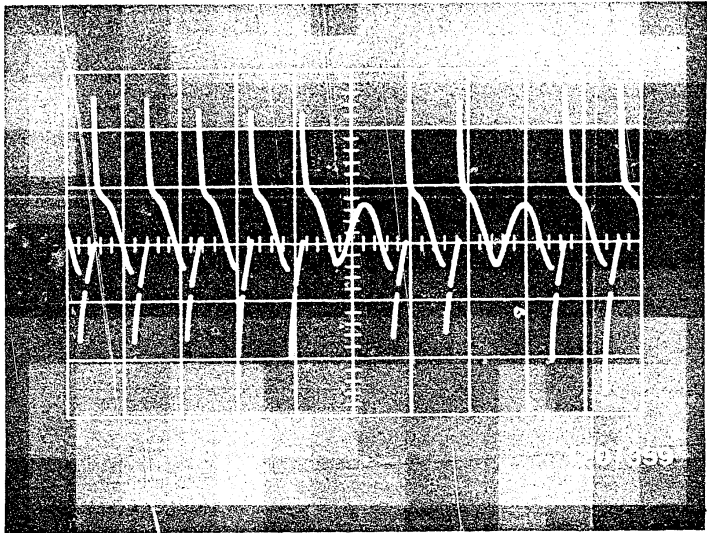
Briefly interrupt the alternator current by removing the B+ connection or, in the case of test bench EFLJ 70 A, briefly switch off switch for positive power supply. While B+ is switched off, the oscilloscope must show a pattern as above.

D10

Testing

Alternators 0 120 300..., 0 120 339...





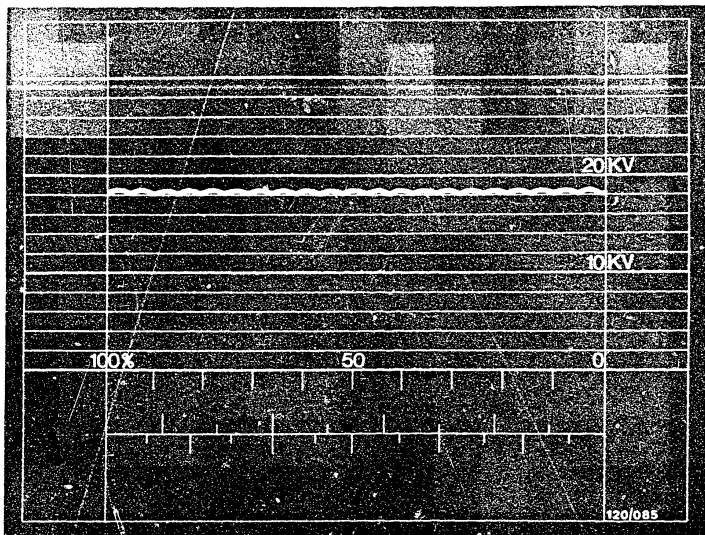
This is the pattern of a defective unidirectional-breakdown diode. (open circuit). If the unidirectional-breakdown diode has a short circuit to ground, the alternator is not excited.

D11

Testing

Alternators 0 120 300.., 0 120 339..,





Adjusting and evaluating the oscilloscope displays

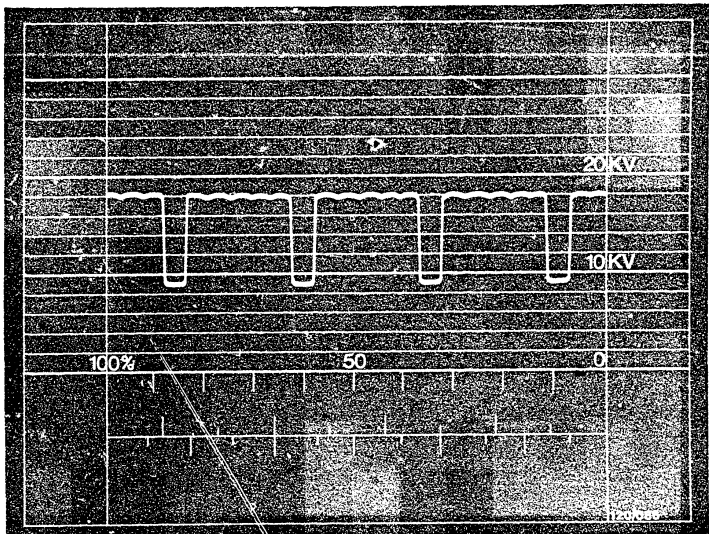
If the alternator is in proper working order, the above display is obtained. The DC voltage supplied has a slight ripple content. The oscilloscope display may have small spikes superimposed on it when the regulator is in operation. The regulator can be "shut down" by connecting in a load (e.g. loading resistor).

Adjust the height of the display so that the ripple content is between two kV lines.

In order to compare such displays, the respective display must be adjusted using the vertical controller of the oscilloscope so that it more or less fits in between the 10 and 20 kV lines.

Note: It is also possible for several defects to occur together.





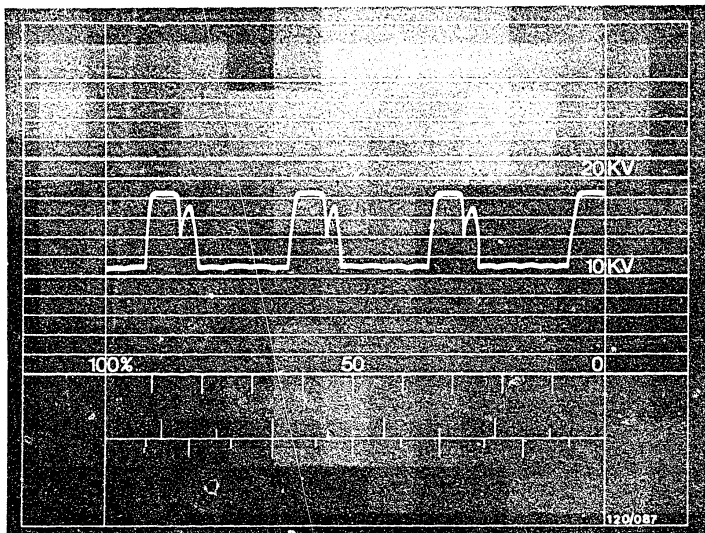
Oscilloscope display shows open circuit in an exciter diode

D13

Testing

Alternators 0 120 300 ... 0 120 339





Oscilloscope display shows open circuit in a positive diode.

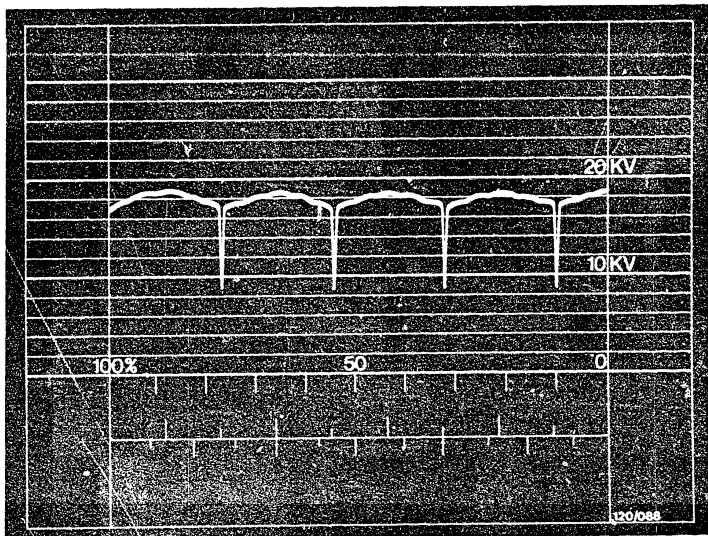
If, on the generator, a number of rectifiers are connected in parallel, this display only appears if all diodes are open-circuit.

D14

Testing

Alternators 0 120 300..., 0 120 339...,

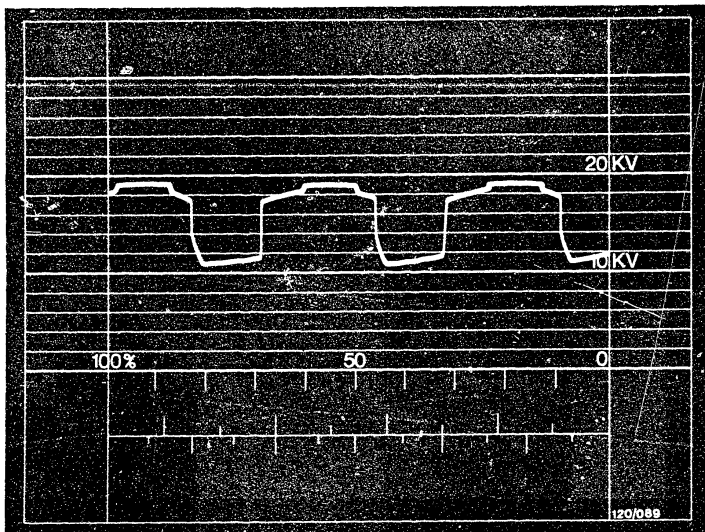




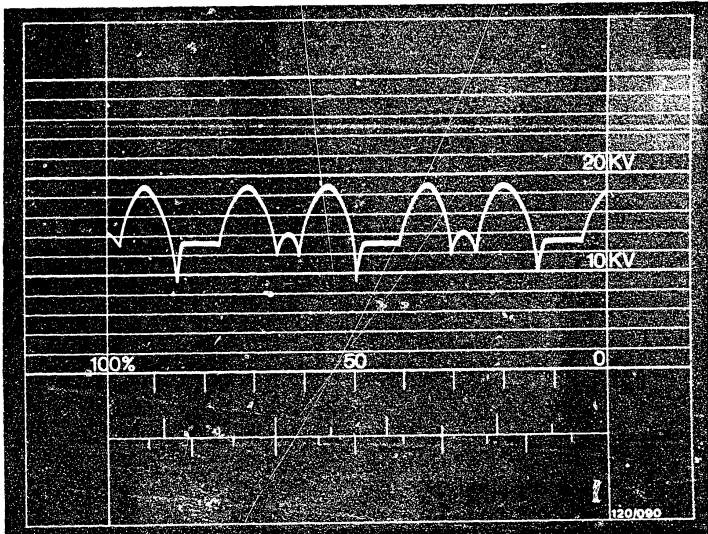
Oscilloscope display shows open circuit in a negative diode.

If, on the generator, a number if rectifiers are connected in parallel, this display only appears if all diodes are open-circuited.





Oscilloscope display shows short circuit in an exciter diode



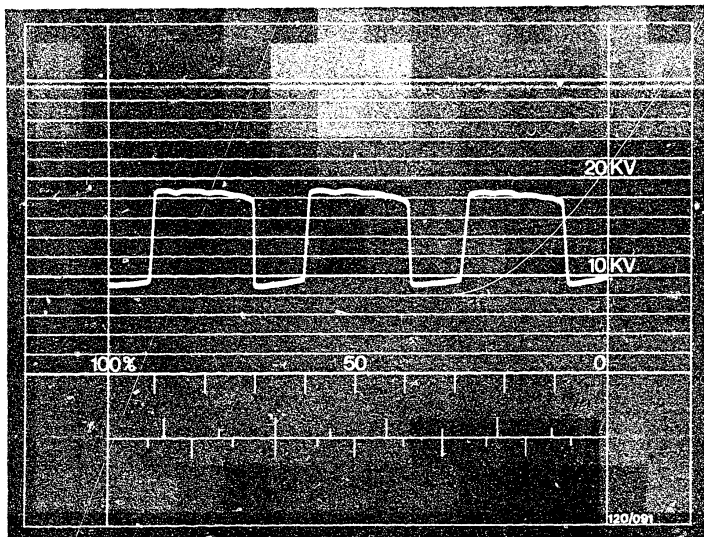
Oscilloscope display shows short circuit of one, or more, positive diodes.

D17

Testing

Alternators 0 120 300.. , 0 120 339 ...





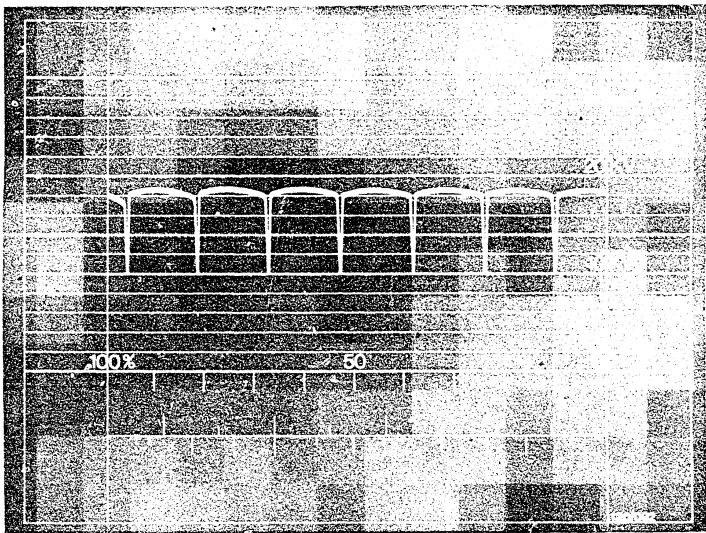
Oscilloscope display shows short circuit of one, or more, negative diodes.

D18

Testing

Alternators 0 120 300..., 0 120 339...





Oscilloscope display shows phase defect (open circuit)



After-sales Service

Technical Bulletin

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Parts Cleaning

Use of highly-inflammable cleaning agents, or cleaning agents which are dangerous to health

Gen.

VDT-I-Gen./18 En
7.1978

When cleaning parts which come from vehicle electrical products prior to repair, it is permitted to use the following cleaning agents: Benzine, trichloethylene (tri) and perchloroethylene (per). These are dangerous, and must be handled with appropriate care. The relevant safety regulations in West Germany are:

Regulations concerning work with inflammable liquids
(VbF) issued by the Federal Labor Ministry (BmA).

Safety regulations for the use of chlorinated hydrocarbons
as applied to the works ZH1/222
as applied to personnel ZH1/119

as issued by the Federation of the Trade co-operative Associations
(Central Association for Accident Prevention and Industrial Medicine)
Langartweg 103, D-5300 Bonn 5).

1. Benzine, acetone and ethanol (ethyl alcohol) are inflammable liquids and their mixtures with air are dangerous due to the risk of explosion. Parts washing may only take place in tanks or containers solely intended for this purpose and equipped with a "melt" safety device for the lid which, in case the liquid catches fire, causes the lid to close automatically and smother the fire. In the case of larger containers (exceeding 500 x 500mm) some form of suction extraction must be provided.

- 1.1 Generators, alternators, wiper motors, small-power motors and other electrical equipment for installation in vehicles are, in ever increasing numbers, being equipped with capacitors having long storage times (e.g. for interference-suppression purposes in radio-receiver or transmitter installations).

When washing such parts, it is possible that a capacitor discharge can occur when the part is immersed in the cleaning agent. This can lead to an inflammable liquid catching fire. For this reason, parts on which a capacitor is fitted are only to be washed in trichlorethylene (tri) or perchloroethylene (per).

- 1.2 In the case of starting motors, it has already been pointed out in earlier repair instructions that the parts should be thoroughly dried after washing in benzine, this applies particularly to windings. With sliding-gear starting motors, the first test run after washing out must be performed without the closure cap in order to avoid the possibility of explosion.

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Li

Technical Bulletin

Alternators 0 120 300 ... 0 120 339



2. Trichlorethylene (tri) and perchloroethylene (per) are both liquids whose vapors have a stupefying effect, and which are dangerous to health if inhaled over long periods. Tri vapor is heavier than air, and therefore especially dangerous at floor level. Gloves and goggles are to be worn when washing out parts in these liquids.

If cleaning of parts is carried out regularly, or continuously, in trichlorethylene only containers or tanks intended solely for this purpose are to be used, and the suction extraction device is to be switched on. When washing parts do not bend over the container.

L2

Technical Bulletin

Alternators 0 120 300 ... 0 120 339



After-sales Service

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Steel sheet fan wheels for alternators

Assembly instructions

12

VDT-I-120/103 B
Suppl. 1
7. 1977

Summary

When assembling the fan wheel and pulley, attention is to be paid to the correct sequence and position of the accessories, in particular the new supporting plate. See Figs. 1 ... 4 for assembly examples.

Details

Since the end of 1976 supporting plate 1 120 140 009 has been mounted between the fan and pulley assembly within the scope of further development for various alternators provided with steel sheet fan wheels.

The outside diameter of this new supporting plate (item a) is 55 mm. The 5 mm wide and approx. 0.3 mm high stamping on the rim presses against the fan. A slotted washer (item b) or the pulley itself is mounted directly on the side facing the pulley, depending on the alternator model. Care is to be taken that the 26 mm diameter collar of the slotted washer or pulley presses against the supporting plate.

In the case of steel sheet pulleys a second slotted washer (item c) is mounted between the pulley and spring lock washer. The spring lock washer or spring washer, as well as the fastener nut remain unchanged.

The tightening torque for the entire assembly continues to be 35 ... 45 N.m (approx. 3.5 ... 4.5 kgf.m).

Tool KDL 6006 is required to hold the pulley when tightening the nut.

Under no circumstances should the fan wheel be locked using a screwdriver or similar. Bent or damaged fan blades result in damage to the alternator.

In the case of alternators which are provided with the supporting plate ex-works, this plate must also be installed when repair work is performed. Basic information regarding use is provided by the service part documents and packing notes for service part packages. Supporting plate 1 120 140 009 is included in the scope of delivery of the pulley.

The complete assembly is matched to the alignment of the V-belt. Modifications or assembly errors may cause damage.

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L3

Technical Bulletin

Alternators 0 120 300 ... 0 120 339



Careful replacement of the steel sheet fan wheel when repairing or exchanging the alternator after operating for more than 100 000 km or 2000 running hours is still required.

Assembly examples for supporting plate 1 120 140 009

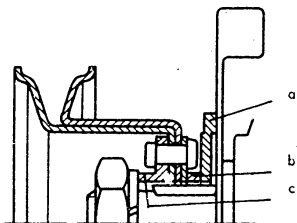


Fig. 1 Single-piece steel sheet pulley with deep hub

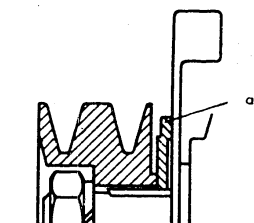


Fig. 2 Solid single-piece pulley

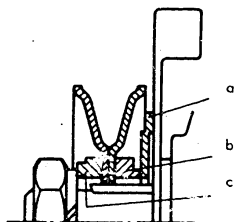


Fig. 3 Two-piece steel sheet pulley

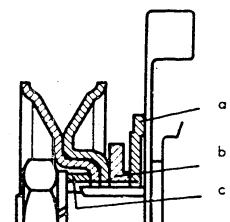


Fig. 4 Offset two-piece steel sheet pulley

Designation of individual components

- a Supporting plate 1 120 140 009
- b Rear slotted washer
- c Front slotted washer



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EXTERNALLY MOUNTED TRANSISTOR REGULATOR 14 V ..
1 197 311 ..

12
VDT-I-120/105 En
2 '980
Supersedes Ed. 9.78

In addition to the already familiar EE externally mounted transistor regulators 0 192 052 .., the regulator 1 197 311 .. (EL 14 V ..) is finding increased application on a variety of different alternator models.

In case of complaints regarding the EL regulator 1 197 311 001/002 - for alternator collector ring with 32 mm diameter - the EL regulator 1 197 311 001 as well as the EE regulator 0 192 052 006 can be used as replacements.

When fitting an EE regulator, it must be taken into account that the housing is larger, that is, fitting space must be available.

The EL regulator 1 197 311 003 and ..004 for alternator collector rings with a diameter of 28 mm can only be replaced by the model 1 197 311 003.

This regulator is fitted with a 68 Ω resistor between D+ and D-.

Further EL regulator models not listed here, and their replacements, are to be found in the EE microfiches of the alternators concerned.

It is not possible to fit a regulator with lengthened brush holder (for alternators with collector-ring diameter 28 mm) to alternators with collector-ring diameter 32 mm. Neither can the regulator with lengthened brush holder for 32 mm diameter be fitted to the 28 mm dia. model.

The production of alternators with a collector-ring diameter of 28 mm instead of 32 mm is increasing.

Warranty procedure

The normal warranty conditions apply to the regulator 1 197 311 .. (EL 14 V ..). In the case of justified complaints, the precise part number of the alternator is to be entered in the column for the damaged product.

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L5

Technical Bulletin

Alternators 0 120 300 ... 0 120 339



After-sales Service

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SOLUTION TO THE WIRING-HARNESS REPAIR PROBLEM

12

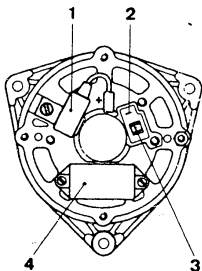
on alternators with attached-type regulators
and plug-in connection for B+ and B-

VDT-I-120/106 En
3.1979

In most vehicles the cable connections from the alternator/generator are welded to the wiring harness plug. This means that if the plug is damaged, a repair cannot be carried out.

In order to make repair possible, therefore, we have introduced a plug housing with 3 blade terminals into the program. Part number: 1 297 011 001. Remove the old plug-in connection, strip about 1 cm of insulation from the wire and crimp on the new blade terminals using the Eisemann crimping tool. Fit the blade terminals in the plug housing.

This parts set will be included in the service-parts lists for the generators/alternators in question.



- 1 = Suppression capacitor
- 2 = Blade terminal 6.3 x 0.5 (D+)
- 3 = Blade terminals 9.5 x 1.2 (B+)
- 4 = Transistor regulator

Fig. 1 Plug-in connection

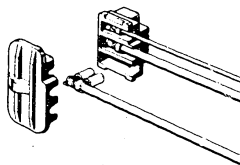


Fig. 2 Plug housing with blade terminals

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Technical Bulletin

Alternators 0 120 300 ... 0 120 339



After-sales Service

Technical Bulletin

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ALTERNATORS 0 120 ..

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VDT-I-120/107 En

9.1979

Alternator operation without battery

General

Unless special measures are taken, alternators are not to be operated without the battery connected because otherwise this can lead to the destruction of semiconductor components in the regulator, alternator or vehicle electrical system.

In the case of special-purpose vehicles, auxiliary or stationary equipment, or vehicle export, it can be necessary for the alternator to operate without battery - with or without power output.

With systems where the regulator is mounted separately from the alternator, the alternator is placed out of operation before starting by open-circuiting the line between it and the regulator. Power output is now impossible.

This method cannot be used with systems having an attached-type regulator. In such cases, the following methods are used. Details can be taken from the product specifications.

1. Systems with increased voltage-proof characteristics

A variety of vehicle manufacturers order such systems because during shipping it can occur that operation takes place without battery. In such exigencies, power output is possible depending upon alternator speed. These measures protect the alternator and regulator but not the loads.

2. Zener diode 1 127 328 .. for 14 V alternators and max. 35 A

This Zener diode is connected to Terminal B+ of the alternator. If the voltage rises above the response voltage of the Zener diode this conducts and the voltage peak is conducted away through the diode heat sink to the alternator housing. In this way semicon-

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ductors in the alternator and regulator are protected against voltage peaks and if necessary the system can deliver power. If required, this Zener diode can be fitted as series equipment on new alternators or can be retro-fitted. Connection in parallel or series of these Zener diodes for the purpose of increasing the power is not possible.

Notes on testing are contained in Instructions VDT-W-120/300.

Burnt-out connections between Zener diode and alternator B+ are the result of false polarity during battery change, use of auxiliary starting aids or operation with 24 V etc. Warranty claims are therefore to be rejected.

3. Systems with over-voltage protection devices fitted

For years, such devices (OSG) have been available either integrated in the regulator e.g. 0 192 083 .. or separate 0 192 900 .. for use in 28 V systems.

When voltages occur in excess of the OSG response voltage, the Terminals D+ and D- are connected together by the OSG. The alternator is short-circuited and cannot self-excite. This means that resultant damage in the vehicle electrical system due to excessive alternator voltage is avoided.

As long as the OSG does not conduct, without battery connected, the alternator can deliver power.

4. Short-circuit capsule 1 120 505 000 for K1, N1 and T1 alternators

In order that the alternator does not self-excite during operation without battery, Terminals D+ and D- are connected together. At customer request, certain alternator models are equipped at the works with a short-circuit capsule connected to Terminal D+ for this reason. This enables engines and vehicles to be tested on dynamometers etc. without the battery being connected. Power cannot be taken from the alternator.

After the battery is connected the capsule is removed so that the system is ready for operation. If, subsequently, operation without battery is required, D+ and D- must be connected together again.

Details regarding the Part Numbers of the products dealt with in this Bulletin can be requested from your local Bosch representative.



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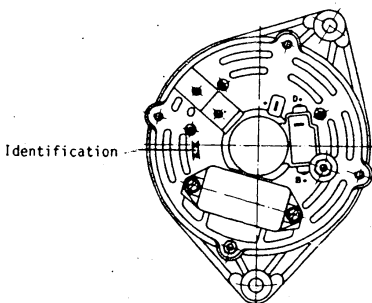
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ADDITIONAL IDENTIFICATION OF
ALTERNATORS 0 120 ..

VDT-I-120/116 En
4.1981

Since date of manufacture FD 143 (March 1981) the alternators fitted with stick-on nameplates have received an additional identification. This takes the form of stamping the last 4 figures of the appropriate part number on a suitable place on the front of the collector-ring end shield. The figures are 4 mm high. The exterior characteristics of the alternators make it possible to find out the remaining 6 figures of the part number.

Since the introduction of this additional identification, the part number of an alternator can be ascertained even if the nameplate is missing or has become illegible. This makes it easier to find technical data in such cases, as well as to quote the full part number in correspondence or in guarantee claims.



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